ISSUE 189 MARCH 2009

Better Homes and Gardens

WOOD

FREE FULL-SIZE PATTERNS INSIDE

Build This Gorgeous Lingerie Chest
p.34

Foolproof Jointing & Planing
p.60

30-minute Project: Sanding Disc Storage
p.32

Design Your Projects on a Computer It's *EASY!*
p.64

More Projects!

- Super-simple Bookshelves p.70
- Clutter-busting Organizer p.49
- Nifty Napkin Holder p.20

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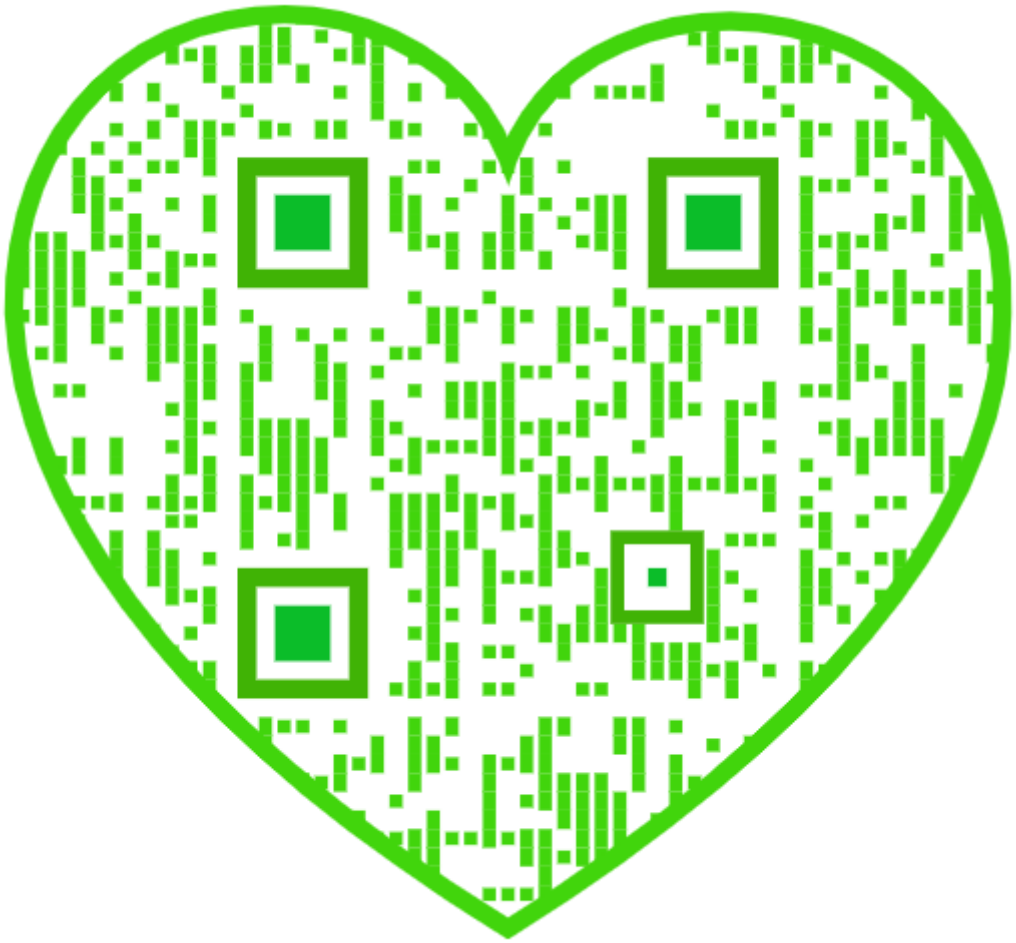

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- Approx. shipping weight: 414 lbs.

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- Capacity: 3 1/4" @ 90°, 2 1/4" @ 45°
- Approx. shipping weight: 342 lbs.

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Includes Cast Iron Miter Gauge

G0661
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2 HP, 10" Hybrid Cabinet Saw

- Motor: 2 HP, 110V/220V, single-phase
- Precision ground cast iron table size w/wings attached: 27" x 39 1/2"
- Arbor: 5/8" • Rip capacity: 30"
- Capacity: 3" @ 90°, 2 1/8" @ 45°
- Cast iron miter gauge
- Approx. shipping weight: 439 lbs.

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14" Heavy-Duty Bandsaw

Fine WoodWorking

- Motor: 1 1/2 HP, 110V/220V, single-phase, TEFC, 1725 RPM
- Precision ground cast iron table
- Table size: 20 1/2" x 14"
  - Table tilt: 45° R, 10° L
  - Cutting capacity/throat: 13 1/2"
  - Max. cutting height: 6"
  - Blade size: 92 1/2" to 93 1/2" (1/8" - 3/4" W)
  - Cast iron wheels
  - Approx. shipping weight: 262 lbs.

Includes Deluxe Aluminum Re-saw Fence & Work Light

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- Motor: 2 HP, 110V/220V, single-phase, TEFC, 1725 RPM
- Precision ground cast iron table
- Table size: 19 3/4" x 14 3/16"
- Table tilt: 45° R, 8° L
- Cutting capacity/throat: 13 1/2"
- Max. cutting height: 10"
- Blade size: 106" L (1/8" - 3/4" W)
  - Blade speed: 3000 FPM
  - 6" re-saw fence
  - Approx. shipping weight: 284 lbs.

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- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron table
  - Table size: 26 3/4" x 19" x 1 1/2"
  - Cutting capacity/throat: 18 1/4"
  - Max. cutting height: 12"
  - Blade size: 143" L (1/8" - 1 1/4" wide)
  - 2 Blade speeds: 1700, 3500 FPM
  - Approx. shipping weight: 458 lbs.

Includes Aluminum Re-saw Fence Attachment, Dual Ball Bearing Blade Guides, Cast Iron Wheels & Fence

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- Cutterhead speed: 5000 RPM
- Built-in mobile base
- Magnetic safety switch
- Heavy-duty cast iron construction
- Approx. shipping weight: 675 lbs.

4" DUST PORT & BOARD RETURN ROLLERS

G0453
4 Blade Cutterhead ONLY $950.00

G0453Z Z SERIES
Spiral Cutterhead ONLY $1495.00 $139 ANYWHERE IN LOWER 48 STATES

Spiral Cutterhead

8" Jointer *w/Exclusive Digital Height Readout*

PATENT PENDING DIGITAL READOUT

EXTREME SERIES

- Motor: 3 HP, 220V, single-phase, TEFC
- Precision ground cast iron tables
- Total table size: 8" x 76⅜"
- Infeed table size: 8" x 43⅜"
- 4 row spiral cutterhead
- Cutterhead speed: 5350 RPM
- Max. rabbeting depth: ½"
- Deluxe cast iron fence size: 35"L x 1¼"W x 5"H
- Approx. shipping weight: 597 lbs.

MADE IN ISO 9001 FACTORY!

Extra Long Infeed Table & Extra Tall Fence with Rack & Pinion Adjustment

INCLUDES FREE SAFETY PUSH BLOCKS

G0495X ONLY $1795.00 $139 ANYWHERE IN LOWER 48 STATES

13" Planer *w/Dust Collection*

- Motor: 2 HP, 110V, single-phase
- Max. cutting width: 13"
- Max. cutting height: 6"
- Max. cutting depth: 1/16"
- Cutterhead speed: 8000 RPM
- Feed rate: 19 FPM
- Knives: 2 double-edged HSS
- Approx. shipping weight: 95 lbs.

Brand New!

Includes 2½" Dust Port & Collection Bag, Side Handles & Flip Up Wings for Portability!

G0689
INTRODUCTORY PRICE $375.00 $39 ANYWHERE IN LOWER 48 STATES

6" Parallelogram Jointers

- Motor: 1½ HP, 110V/220V, single-phase
- Precision ground cast iron tables size: 6" x 55½"
- Rabbeting capacity: ½" • Max. depth of cut: ⅛"
- Cutterhead speed: 4850 RPM
- Parallelogram table adjustment
- Center mounted fence
- Built-in mobile base
- Approx. shipping weight: 362 lbs.

INCLUDES FREE SAFETY PUSH BLOCKS

G0604X
4 KNIFE CUTTERHEAD
ONLY $650.00

G0604ZX
SPIRAL CUTTERHEAD
ONLY $895.00 $89 ANYWHERE IN LOWER 48 STATES

8" Jointers *w/Built-in Mobile Base*

- Motor: 3 HP, 220V, single-phase, TEFC, 3450 RPM
- Precision ground cast iron tables size: 9" x 72½"
- Rabbeting capacity: ½" • Max. depth of cut: ⅛"
- Cutterhead speed: 5000 RPM
- Deluxe cast iron fence size: 35" L x 5" H
- Built-in mobile base
- Approx. shipping weight: 552 lbs.

INCLUDES FREE SAFETY PUSH BLOCKS

G0656
4 KNIFE CUTTERHEAD
ONLY $795.00

Brand New!

G0656X
SPIRAL CUTTERHEAD
ONLY $1095.00 $139 ANYWHERE IN LOWER 48 STATES

12" Baby Drum Sander

- Sanding motor: 1½ HP, 110V, single-phase
- Conveyor motor: 1/10 HP, 110V, single-phase, variable speed 0-15 FPM
- Drum surface speed: 2300 FPM
- Max. stock dimensions: 12" wide x 3½" thick
- Min. stock length: 8"
- Sanding drum size: 4"
- Sanding belt: 3" hook & loop
- Approx. shipping weight: 160 lbs.

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2 ADJUSTABLE PRESSURE ROLLERS & INDUSTRIAL-DUTY BELT

G0459
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3 HP Shaper

- Motor: 3 HP, 220V, single-phase w/reversing switch
- Precision ground cast iron table
- Table w/standard wing attached: 30½" x 20¼"
- 3 interchangeable spindles: ½", ¾" & 1"
- Spindle travel: 3"
- Spindle speeds: 7000 & 10,000 RPM
- Spindle openings on table: 1⅜", 2¾", 4" & 5½"
- Approx. shipping weight: 357 lbs.

Includes Magnetic Power Switch, Miter Gauge & Fence with Hold-down Springs

G1026 ~~$975.00~~
ONLY $925.00 $89 ANYWHERE IN LOWER 48 STATES

1½ HP Cyclone Dust Collector

- Motor: 1½ HP, 110V/220V, single-phase, TEFC Class "F", 60 Hertz/3450 RPM
- Intake hole size: 6"
- Impeller: 12½" steel
- Suction capacity: 1025 CFM @ 2.6 SP
- Max. static pressure (in. of water): 10.3"
- Filter: .02-2 microns (99% efficiency)
- Filter surface area: 96 sq. ft.
- Collection drum: 35 gal. steel
- Approx. shipping weight: 313 lbs.

G0443 ONLY $895.00 $69 ANYWHERE IN LOWER 48 STATES

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in this issue

TOOLS & MATERIALS

16 Shop-proven Products
Granite-enhanced woodworking machines, more.

22 Six Gotta-have Gadgets for Tool Set-up
These inexpensive shop aids help you make projects that look like a million bucks.

28 Wise Buys: Router-table Power Switches

54 Tool test: 6" jointers
You can't finish square if you don't start square. True faces and straight edges begin with a jointer.

PROJECTS

20 Made-from-scraps Napkin Holder

32 Shop Project: Sanding-disc Caddy

34 Cover Project: Lingerie Chest

49 Wall-hung Organizer
Hide keys, cell phones, and more in this convenient by-the-door catch-all.

70 Basic-Built: Stacking Shelves
These versatile modular units reconfigure easily as your space or needs change.

TECHNIQUES

30 How to Fix Uneven Table legs

42 Learn to Turn: Scrapers & Parting Tools

60 No-fail Jointing and Planing Routines
Here's how to maximize the performance of these essential woodworking machines.

64 Design Projects on Your Computer
Discover how free, powerful software will help you create accurate and detailed designs.

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This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.

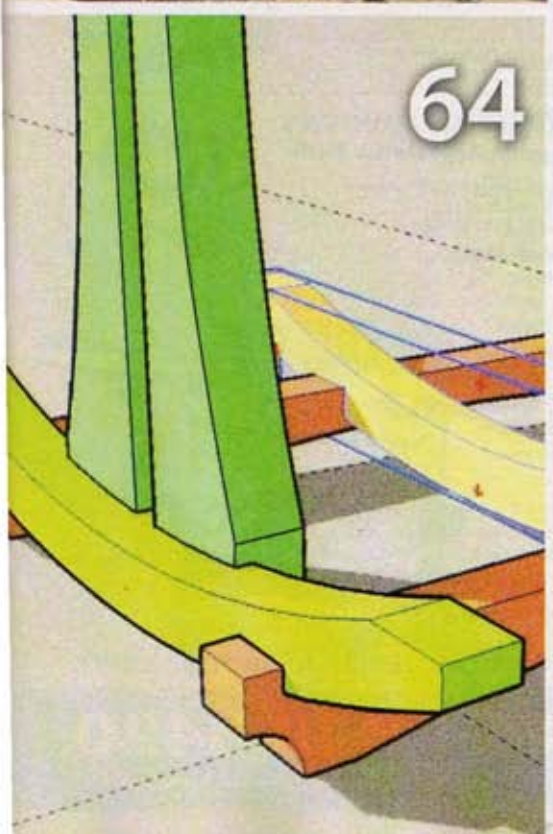
DEPARTMENTS

6 Sounding Board

8 Shop Tips

76 Ask WOOD

92 What's Ahead



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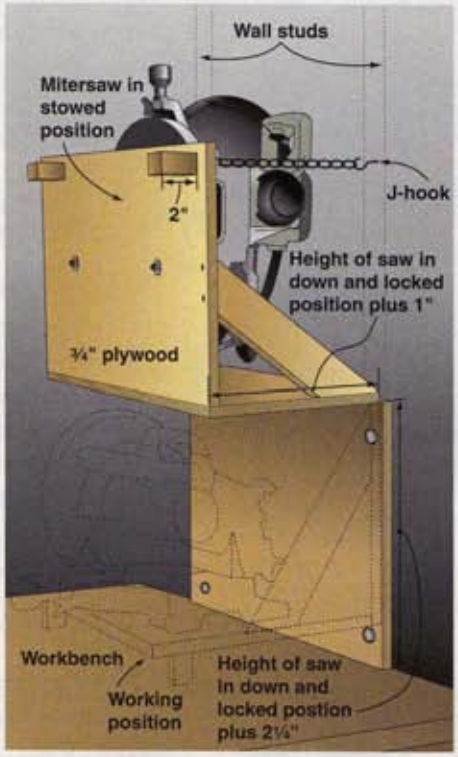
SHOW OFF YOUR SHOP, SEE OTHERS

Check out the new Shop Showcase forum at woodmagazine.com/shopshowplace, where you can post brag-book photos and descriptions of your shop; browse and get ideas; or just ask questions about shop flooring, walls, lighting, etc. Here's a snapshot from John Moody of Florence, Ala.

SAVE SPACE AND MONEY

For woodworkers, storage space and cash always seem to be in short supply. *WOOD* Online® comes to your rescue with dozens of shop-stretching project plans and organizers, all free for the download at woodmagazine.com/freeplans.



FREE VIDEO: LEARN JOINTING AND PLANING TECHNIQUES

Buying a jointer and planer actually *saves* you money by enabling you to surface cheaper, rough-cut lumber. Learn how to get the most from these machines at woodmagazine.com/videos.

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21", 5 HP BANDSAW with Foot Brake

- 5 HP, 220V, single-phase TEFC motor
- Precision ground cast iron table
- Table size: 20¾" W x 29½" L
- Max. cutting height: 14"
- Cutting capacity/throat: 20"
- Blade size: 165" L (¼" - 1⅜" W)
- Blade speed: 4,600 FPM
- Deluxe cast iron fence with extruded aluminum resaw fence attachment

W1770 21" Bandsaw

MADE IN ISO 9001 FACTORY!

10" SLIDING TABLE SAW with Scoring Blade & Riving Knife

New

- 5 HP, 220V, single-phase, TEFC motor
- Table size with extension wings: 40" W x 47" L
- Sliding table size: 12¼" W x 63" L
- Scoring blade dia.: 3⅛"
- Scoring blade arbor speed: 8,000 RPM
- Main blade arbor speed: 4,000 RPM
- Single lever locking fence

W1811 10" Sliding Table Saw

New

18" OPEN END WIDE-BELT SANDER

- 3 HP, 220V, single-phase,1,725 RPM TEFC sanding drum motor
- Variable speed conveyor feed rate
- Sanding drum speed: 1,850 FPM
- Rubber sanding drum dia: 4"
- Pneumatic belt tracking
- Spring belt tensioning system
- 2 steel pressure rollers
- Amp load meter

W1813 18" Wide-Belt Sander

VARIABLE SPEED PLANER/MOULDER with Stand

New

- 2 HP, 220V, single-phase TEFC motor
- Precision ground cast iron table and infeed & outfeed extension wings
- Cutterhead speed: 7,000 RPM
- 2 HSS cutterhead knives
- Number of cuts per minute: 14,000
- Pedestal mounted control switch with variable speed control
- Dovetailed way with precision gib adjustments

W1812 Planer/Moulder

New

SPIRAL CUTTERHEAD PLANERS with Built-in Mobile Base

- 3 HP or 5 HP, 220V, single-phase motor
- Precision ground cast iron table & extension wings
- 2 speed gear box
- 2 adjustable bed rollers
- German-made carbide insert spiral cutterhead
- Pedestal mounted thermal overload magnetic safety switch
- Built-in locking mobile base

W1742S 15" Planer
W1754S 20" Planer

SPIRAL CUTTERHEAD JOINTERS with Parallelogram Adjustable Beds

New

- 110V or 220V, single-phase, TEFC motor
- Precision ground cast iron table
- German-made carbide insert spiral cutterhead
- Quick adjust levers
- Large center mounted cast iron fence
- Pedestal mounted safety switch
- Built-in locking mobile base

W1755S 6", 1½ HP Jointer
W1741S 8", 3 HP Jointer
W1744S 12", 3 HP Jointer

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March 2009 | Vol. 26, No. 1 | Issue No. 189

We asked our staff:

How do you mark your projects?

I bore a shallow hole with a Forstner bit, then epoxy or super-glue in a penny of the current year.

I carve a simple cross into each piece I build, usually on the bottom. The cross stands for everything I believe in.

I burn my name into the back or bottom of the piece using a branding iron heated by a propane torch.

I sign a hidden portion of the project using a permanent marker.

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In Memoriam — E.T. Meredith III (1933–2003)

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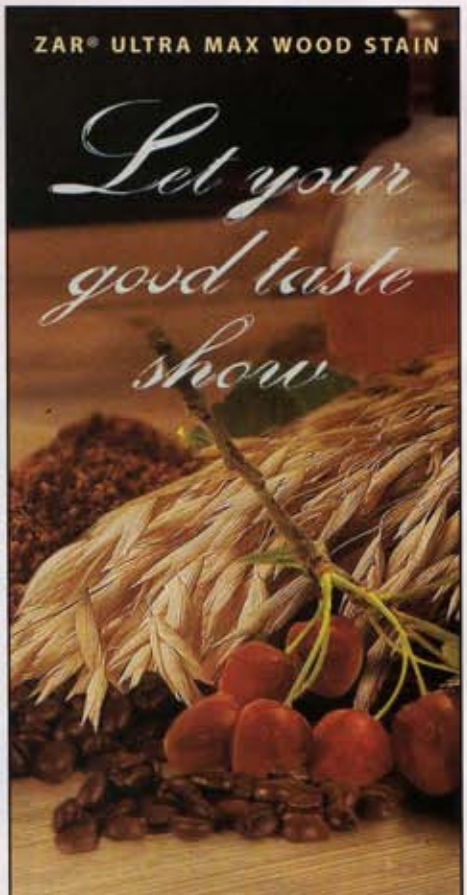

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Our bulletin board for letters, comments, and timely updates

After our review, WorkSharp goes wide

In your review of sharpening systems in issue 186 (October 2008), your assessment of the WorkSharp 3000 reiterated what our customers have been wanting: Greater capacity. We've answered that with a new wide-blade attachment that accepts plane irons up to 3" wide. (The fixed tool holder's limit is 2".) This $85 accessory includes a flat table that mounts onto the tool rest (as shown at *left*), a honing guide with a bevel range from 15° to 60°, and a bevel-setting gauge. You can also hone a 1° microbevel with it. Unfortunately, this attachment does not work on our smaller WorkSharp WS2000.

— Kyle Crawford, Professional Tool Manufacturing

Article update

Issue 186 (October 2008)

■ Rockler no longer sells the barbed threaded inserts used to make the Quilt Ladder on *pages 62–65*. Instead, you can use a similar insert that works with the same connector bolts. Rather than hammering these into the holes, you thread them using a ¼" hex wrench, as shown *below*. Rockler sells the inserts in packs of eight, part #31872, for $4.50. (800-279-4441 or rockler.com)

Custom-made furniture: Who benefits most?

Craftsmen invest more than money in heirlooms

Thank you for the article "Crafting Keepsake Furniture in a Throwaway World" in issue 184 (July 2008). We educate people daily on the difference and value of quality, handmade, solid-wood furniture. People must realize that the wood being harvested in the U.S., shipped overseas to furniture shops, and then shipped back as "disposable furniture" will likely never become an antique, but rather end up in a landfill. Instead, buy furniture made by a craftsman who will stand by his product.

— Mike Schanz, Schanz Furniture & Refinishing, South Amana, Iowa

We heard from several dozen readers like Mike, who not only enjoy their craft but also take pride in knowing their work will be enjoyed by future generations.

—WOOD® editors

Stop and smell the sawdust. You'll love it!

I'm a hobbyist woodworker, not a professional, so for me the point is not about justifying the costs of custom furniture versus imported. I work in my shop because I enjoy the experience and the process of building. While I like to imagine my work lasting for centuries, the reality is it might not because I'm still learning and developing my skills. But that does not rob me of the fun along the journey.

—Howard Denemark, Dallas

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■ **Updates to previously published projects:**
For an up-to-date listing of changes in dimensions and buying-guide sources from issue 1 through today, go to **woodmagazine.com/editorial**.

How Do You Create Stunning French Doors in Any Size, Design & Wood Species?

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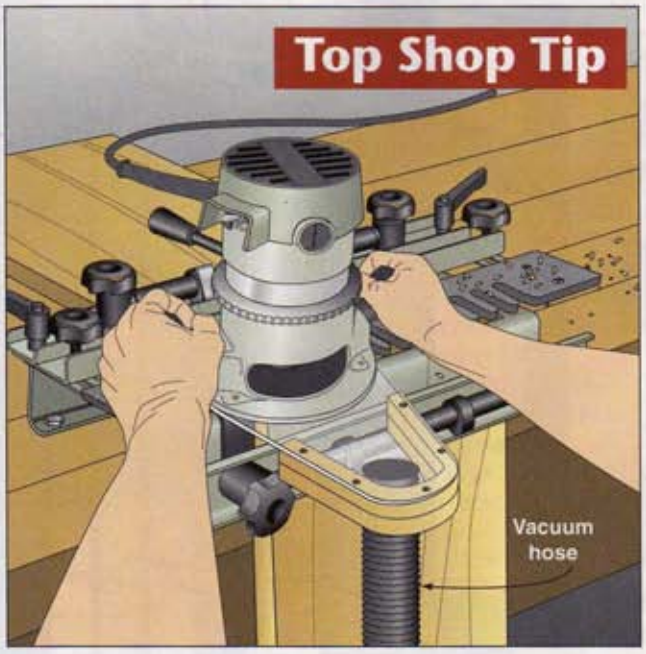
Shop Tips

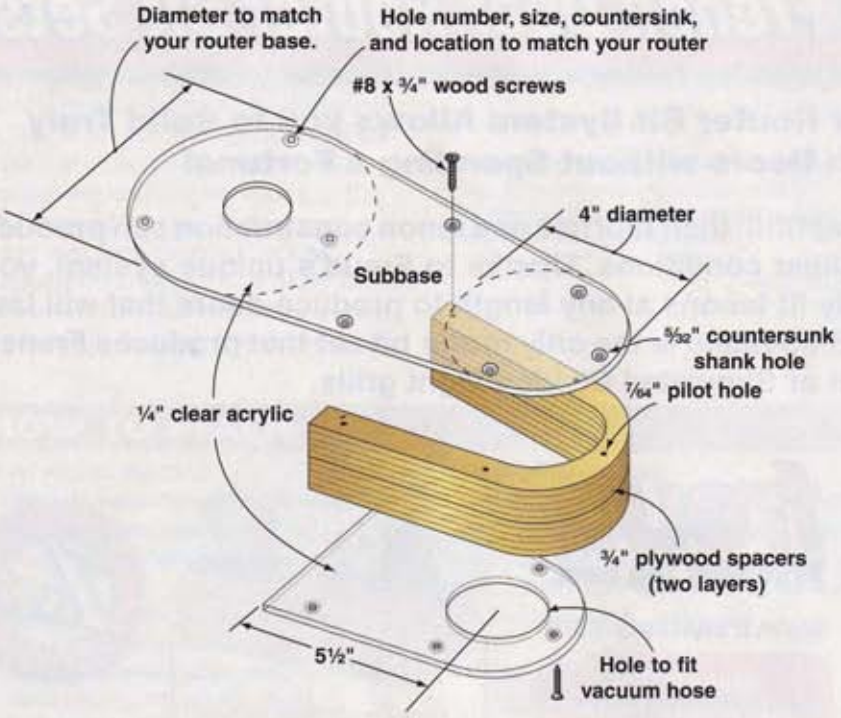
Helping you work faster, smarter, and safer

Do away with dovetail dust



I came up with this attachment for collecting dust from a handheld router—a difficult task at best, especially when using a dovetail jig. From ¼" clear acrylic, cut a subbase with an extended wing, using the dimensions shown *below*. Drill mounting holes to attach the subbase to your router, aligning them so the router handles will line up with the sides of the subbase. Then make a duplicate of only the wing portion of the base with a hole to fit your vacuum hose. At the bandsaw, cut two ¾"-wide curved spacers from ¾" plywood to match the profile of your wing. Glue and stack the spacers together. Drill pilot and shank holes, then assemble the jig. Attach your router, hook up your vacuum hose, and get ready for mess-free routing.

—Reid Smith, Huntsville, Ala.


Diameter to match your router base.
Hole number, size, countersink, and location to match your router
#8 x ¾" wood screws
4" diameter
Subbase
5/32" countersunk shank hole
7/64" pilot hole
¼" clear acrylic
¾" plywood spacers (two layers)
5½"
Hole to fit vacuum hose

continued on page 10

The Top Tipster

Photo: Allison Jensen Photography

Judging from his shop-made hand-tool cabinet *above* (42 hand planes, 58 chisels and carving tools, and 64 marking and measuring tools), you'd think Reid Smith wouldn't have time for anything other than woodworking. But, in addition to his day job, this Renaissance man restores antique autos and races remote-controlled cars. Back in the day, he was even a concert pianist.

For posting this issue's Top Shop Tip, Reid Smith earns a $350 gift certificate from Lee Valley Tools. He might have to add on to his tool cabinet!

Top tips earn tools!

Tell us how you've solved a workshop stumper. If we print it, you'll get $100 and a copy of *450+ Best-Ever Shop Tips* (woodmagazine.com/450tips). And, if your idea garners Top Shop Tip honors, we'll also reward you with a tool prize worth at least $300.

Send your best ideas, along with photos or drawings and your daytime phone number, to: **Shop Tips, WOOD Magazine, 1716 Locust St., LS-221, Des Moines, IA 50309-3023**. Or, by e-mail: shoptips@woodmagazine.com. Include your contact info in the e-mail.

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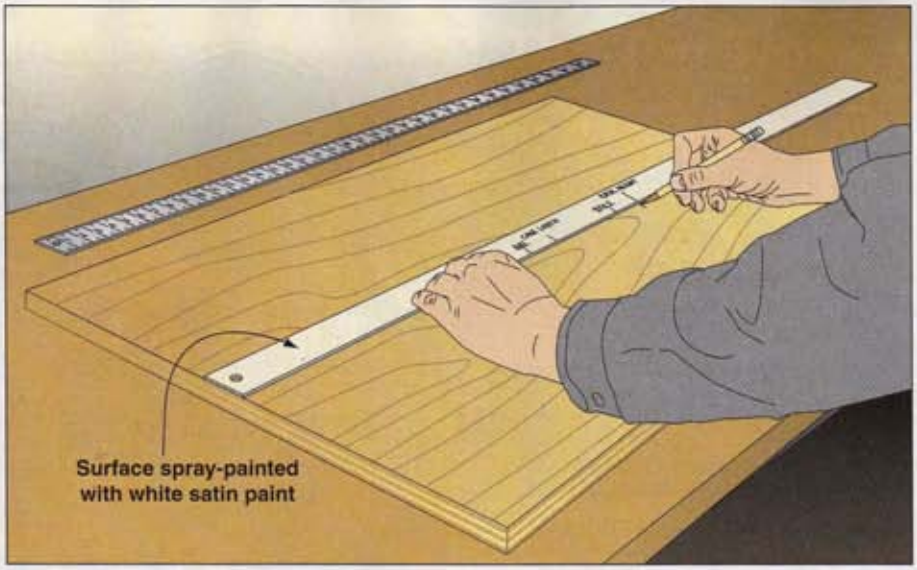
Ensure accuracy with these triple-threat story sticks

My furniture-building accuracy improved dramatically when I started using story sticks—scraps of wood on which I lay out all of a project's critical dimensions and details. But I've carried the concept even further, making these three-in-one story sticks. I did it by spray-painting the backs of my 36" and 48" steel rulers with white satin paint. When the rulers were completely dry, I scuffed the paint lightly with 320-grit sandpaper so penciled story marks would show up well. Because the marks erase easily, I can use the rulers over and over as story sticks. Each one doubles as a straightedge. And, with a flip, triples as a ruler.

—Patrick Conroy, Erie, Colo.

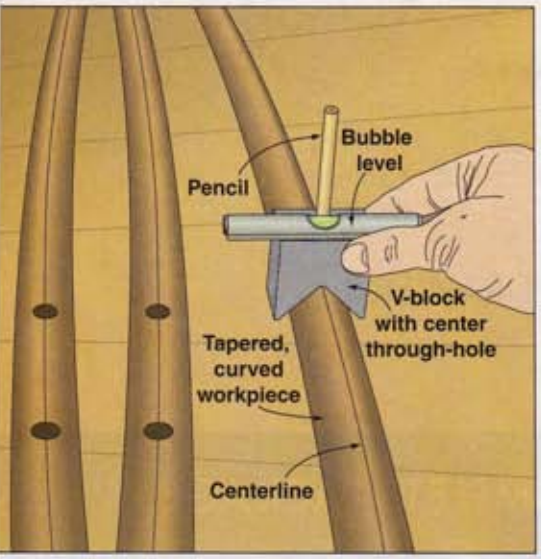


Find center on a tapered, curved chair rail

My chair plans called for turned, tapered, and steam-bent back rails, so I needed a way to find the centerline to position the holes for the back spindles. This easy jig did the trick.

Drill a pencil-sized hole through a ¾×1½×1½" block, cut a V-shape notch into it, glue a small bubble level on one edge, and insert the pencil, as shown *below*. Working on a flat, level surface, with the pencil pressed to the rail, run the V-block along the rail while keeping the bubble centered. The resulting centerline follows the tapers, bends, and curves of the rail.

—Ted Sheroke, Medina, Ohio



ARE YOU READY FOR THIS?

Check all that apply:

- I have a collection of old dull drill bits I just can't throw away.
- I'd rather spend my money on new tools than on buying more drill bits.
- I know I should sharpen my drill bits, but I don't have time to become a sharpening expert.
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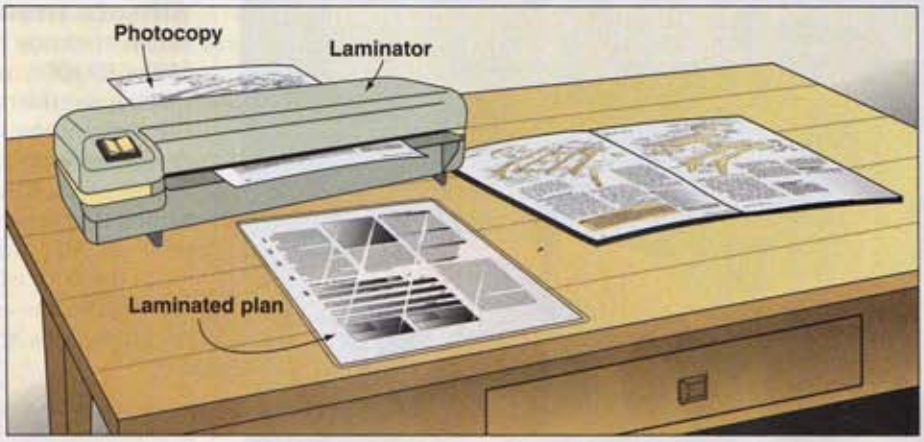
Circle No. 1511

Permanent plan preservation

When I find a woodworking plan I like well enough to graduate it to the workshop, I laminate a color copy of it using an inexpensive laminating machine. (You can buy one from an office supply store for as little as $85.)

Lamination protects the pages from the rigors of project building, including glue drips, stain, and even spilled coffee. Plus, I can jot temporary notes on the plans with a grease pencil. They also store easily, either in a three-ring binder or on a hook by punching a hole in the corner.

—Allan Peters, Agassiz, B.C.



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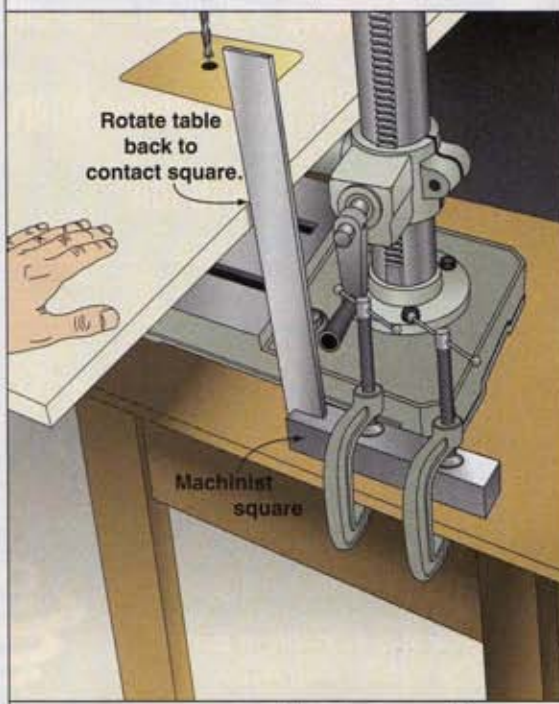
Return your drill-press table to dead center

When I have to bore a counterbore on a shank hole at the drill press, the bit change sometimes requires me to lower the table out of the way. Recentering the workpiece under the bit proves difficult because the table tends to swing left or right as it changes height. Here's a trick for perfect realignment: Before moving the table, clamp a machinist square to the drill-press stand, with the blade against the back of the table. After making the bit change, swing the table back into place until it once again touches the square.

—Avrahami Nissim, Garwolin, Poland



continued on page 12

Circle No. 1665

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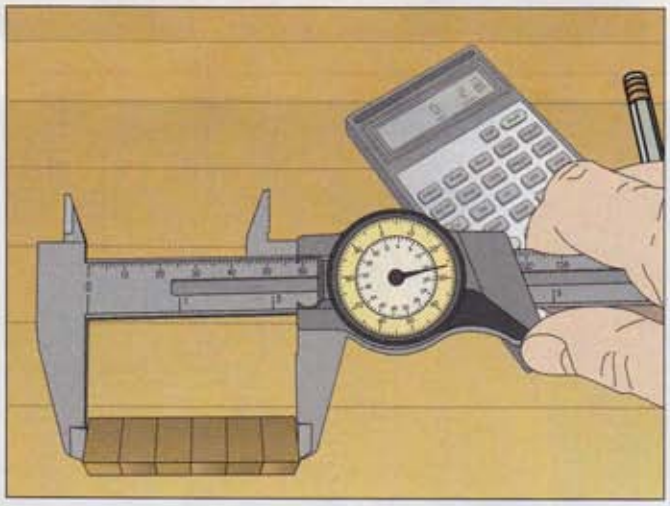
Circle No. 2039

Shop Tips

Multiplication mitigates minute measuring mistake

When I recently made the Outdoor Bar/Server from issue 184 of *WOOD®* magazine (July 2008), I ran into trouble spacing out the two dozen slats that make up the top. A tiny error in the width of my spacers, multiplied by each piece, threw the layout way off. Because the margin of error was so small, it made it hard to measure precisely, so I turned the power of multiplication back against the problem. Aligning six of the spacers together edge-to-edge made the error easy to measure with my calipers. Then I just divided the accumulated error by 6, resized the spacers to compensate, and the slats fit perfectly.

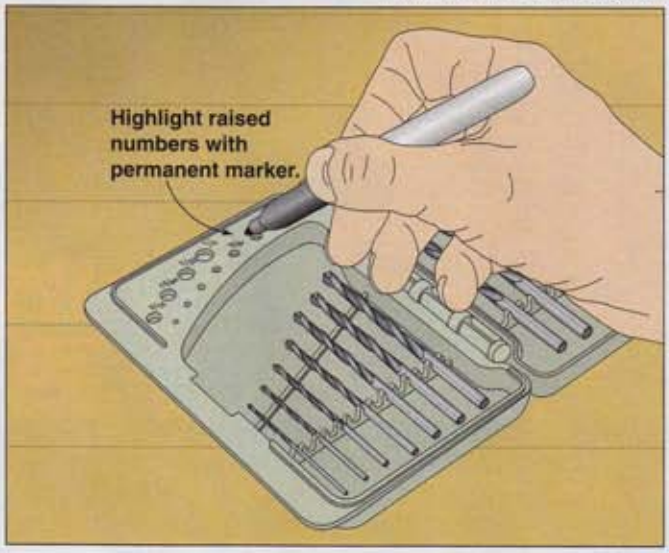
—Erv Roberts, Des Moines, Iowa



Black marker: A sight for sore eyes

The tiny raised lettering on my plastic drill-bit case that indicates the drill-bit sizes proved difficult to read. I fixed this by simply coloring them lightly with a black permanent marker.

—Emilie Redelman, Greensburg, Ind.



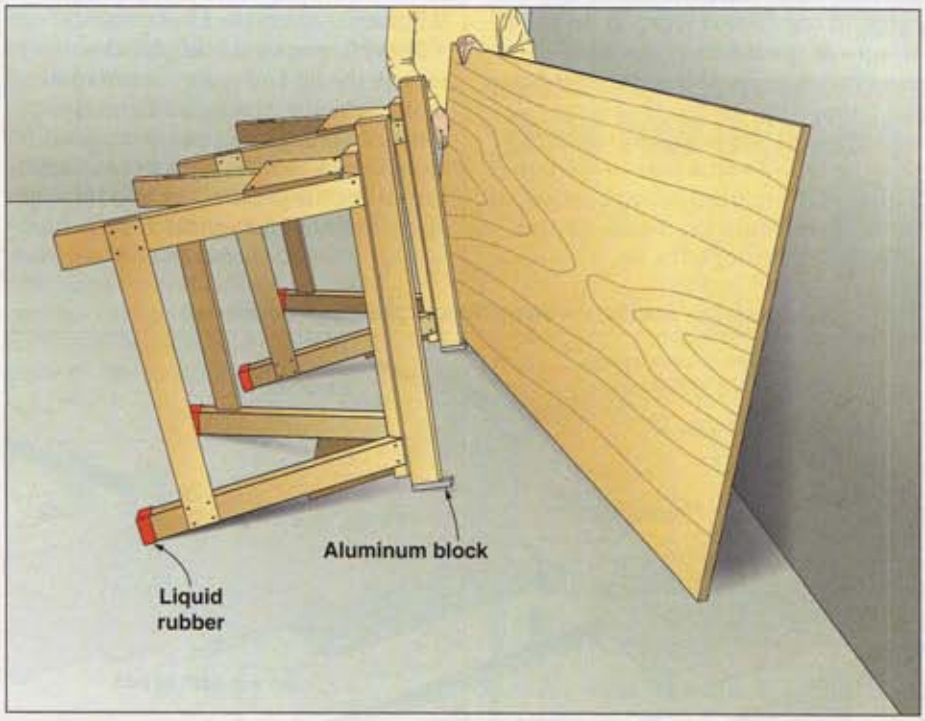
Use (saw)horse power for lifting sheet goods

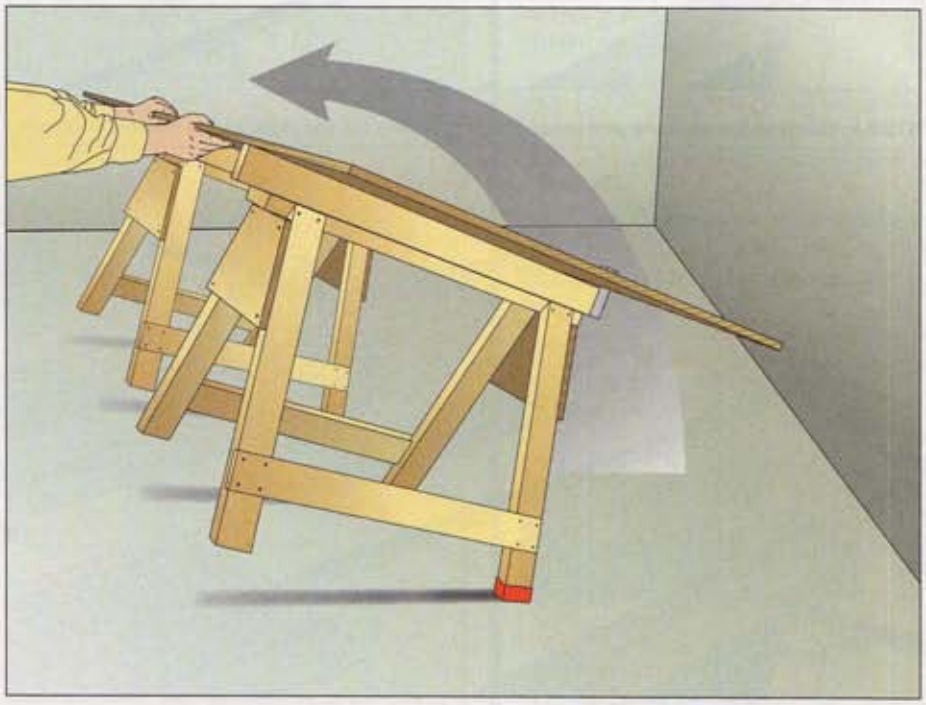
The older I get, the more difficult I find it to handle full sheets of plywood safely. So, I made two simple modifications to my sawhorses that let me easily lift a full sheet.

Simply drill and screw an aluminum block onto one end of each sawhorse as shown. Then, dip the sawhorse feet on that end into liquid rubber, such as Plastidip (800-969-5432, plastidip.com), and let them dry to make them skidproof.

To safely lift a sheet of plywood onto the sawhorses, stand the sawhorses on end next to the plywood, place the edge of the plywood on the aluminum blocks, and tip the sawhorses, plywood and all, into the working position.

—John Andrus, Daytona Beach, Fla.





continued on page 14

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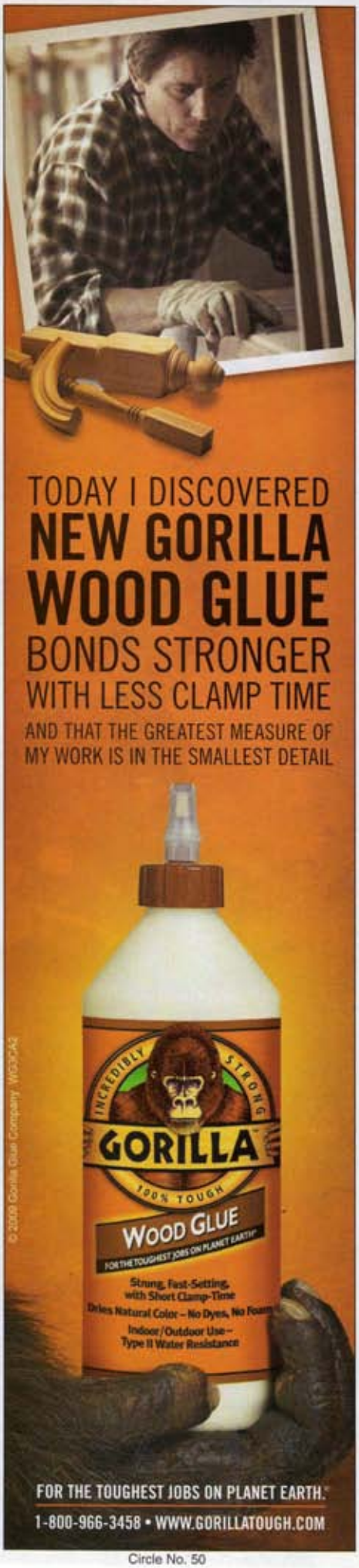


Circle No. 50

A slick trick for routing perfect hinge mortises

Aligning box hinges has always been a trial-and-error proposition for me. The method that I came up with for routing the hinge recesses ensures that the hinges are precisely placed on both the box and the lid, and that their positions mirror each other.

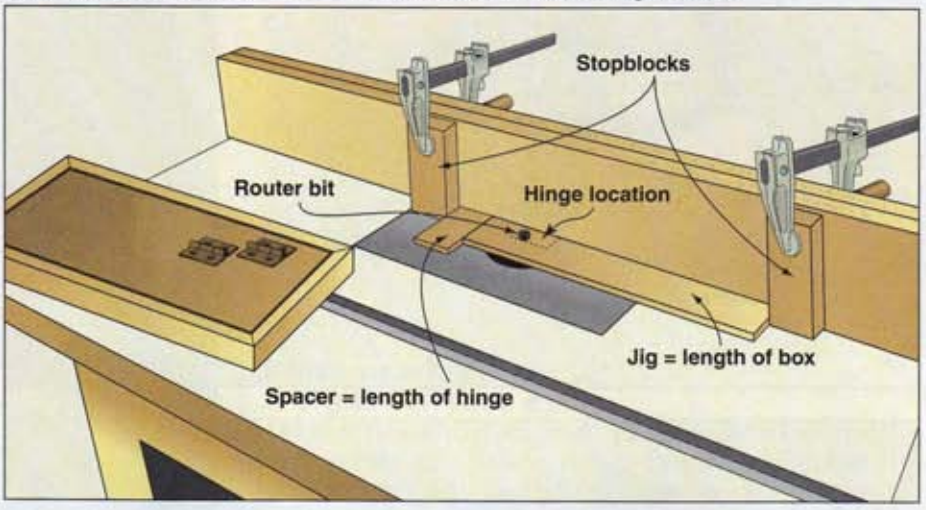
Start with a scrap of ¼" hardboard 4" wide and the same length as your box. On that scrap, trace the leaf of the hinge in the desired location. Install a ¼" up-cut spiral bit in your table-mounted router and lower the bit below the table. With the hardboard jig against the fence, position the fence so that the bit will cut a hole in the outer corner of the marked hinge location, as shown *below*. Turn on the router and raise the bit through the jig.

Next, clamp a stopblock in place at the opposite end to fix the jig's location. Cut a ¼" hardboard spacer the length of the hinge you'll be using. Place this alongside the jig, as shown, and clamp a second stopblock against the spacer. Remove the jig and spacer, set the bit to the proper height for the hinge depth, then rout the hinge recesses from one side of the box and lid using the stopblocks as guides.

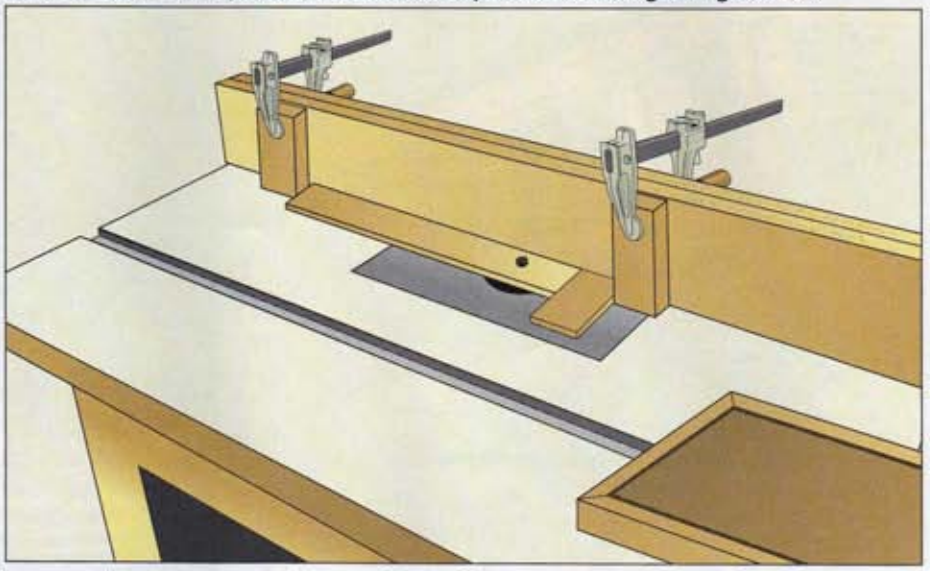
Finally, remove the stopblocks, reverse the jig and spacer orientation, replace the stopblocks, and rout the remaining hinge recesses. After you clean up the corners with a chisel and install the hinges, the box and lid align, and the hinges match perfectly.

—Gordon McGill, Sequim, Wash.

STEP 1: Use spacers to position the stopblocks for the left hinge recess.



STEP 2: Reverse the spacers and reset the stopblocks for the right hinge recess.



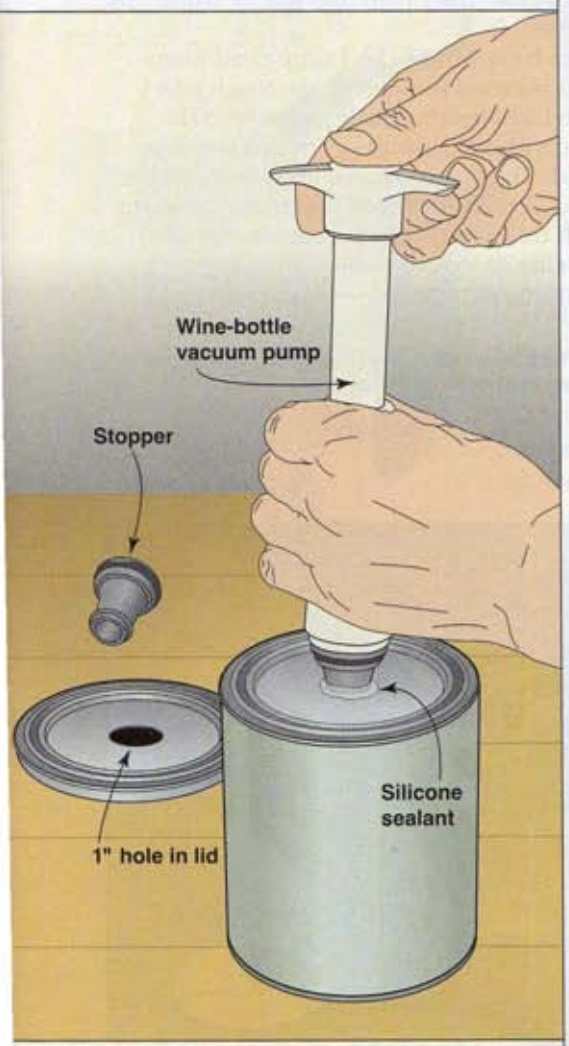
Fine wines and finer finishes

Even in tightly sealed cans, leftover paint and varnish will skin over from the oxygen in the can. I found a solution in my kitchen—a wine bottle vacuum pump used for drawing air from opened wine bottles (Vacu Vin, 704-882-3521, vacuvin.nl).

Whenever I purchase a can of finish, I also pick up a matching extra paint-can lid from my home center. Before opening the finish can, I prep the extra lid like this:

Start by drilling a 1" hole in the extra lid (I used a spade bit). Place the pump's stopper in the hole, sealing it on the top and bottom of the lid with silicone, and let it cure. After you've used the can of finish, replace its lid with your new vacu-lid and use the pump to remove the air. But don't overdo it. I've accidentally crushed a can with the force of the vacuum.

—Bart Crowe, Marietta, Ga.



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Circle No. 2127

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Put a ShopBot to Work in Your Shop

When Justin Rank opened Coastal WoodworX, he knew he would need a professional-grade CNC system to keep up with the competition. He did his homework - researching everything from the economy tools to the big iron machines - and finally decided on a ShopBot.

Justin had his ShopBot PRSalpha up and running in April 2008 and began running files as fast as he could create them. He's been a ShopBotter for less than a year, but Justin is already using his tool to create cabinets, doors, furniture, signs and everything in between.

"The ShopBot is more than a hobby for me. My customers are very impressed with the products it helps me create, and even my shop neighbors are buying from me. I plan on buying another ShopBot this year to help me keep up with the demand I now have for my work."

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Circle No. 1714

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About our product tests

We test hundreds of tools and accessories, but only those that earn at least three stars for performance make the final cut and appear in this section.

Granite machines weigh in with rock-solid showings

When Steel City launched its granite-enhanced tablesaws, bandsaws, and jointers last summer, we greeted the news with skeptical optimism: Sure, the granite is flat and won't rust, but will the hard-but-brittle slabs prove as durable as cast iron? After testing them, we're convinced the granite should withstand the typical bumps and bangs that happen in a woodworking shop. And Steel City (877-724-8665; steelcitytoolworks.com) backs it up with a 10-year warranty. Although you might be attracted by the granite as a curiosity, the performance of these machines also proved worthy in our testing. (For a review of the granite-top hybrid tablesaw, *right*, see issue 187, November 2008.)

6" and 8" jointers

The granite fences on Steel City's 6" and 8" jointers, a $50 upgrade on both machines, proved slippery-smooth and dead-flat. In fact, I found myself using the fence as a straightedge reference rather than the beds, as I've done on my cast-iron jointer beds. Slick UHMW pads keep the granite from scratching the cast-iron beds, but only the 8" model has a rack-and-pinion system, which I prefer, to move the heavy fence.

Fence aside, I really like the long beds on both units—68" on the 6" model, 75½" on the 8"—because they enabled me to joint longer boards than I could on jointers with beds that are typically 20–25 percent shorter. Handwheels make it a snap to precisely adjust the infeed and outfeed table heights, and in no time at all I was getting snipe-free faces and edges. You also get built-in mobile bases, but curiously, the 8" machine's wheels don't swivel.

The 8" model sports three self-indexing, double-edge disposable knives, like those commonly found on benchtop planers these days, so you never have to fuss with jackscrews or a knife-setting jig. I changed these knives in 10 minutes, but needed nearly four times that for the three standard knives on the 6" jointer.

—Tested by Craig Ruegsegger, Multimedia Editor

Performance		★★★★★
Price	6" model, #40615G	$880
	8" model, #40620G	$1,150

14" bandsaw

If you're willing to pony up more than $700 for a loaded 14" bandsaw, choose Steel City's granite-table 50100G ($900) over its sibling with the cast-iron table (#50100, $770). The consistent thickness of the 1¼×16×16" table makes it easy to clamp on jigs and fixtures. It also has a miter slot, although a miter gauge is not included. Besides the table upgrade, the 50100G also comes with a rip fence (optional on the 50100) that adjusts for blade drift, and a 1"-diameter resaw pivot bar, shown *below right*, that mounts to the fence. As a bonus, the fence scale has separate, accurate markings just for using this pivot bar.

Cool table, but can it cut wood? The 1½-hp-rated motor and cast-iron wheels powered through all the tough jobs I could throw at it, and ball-bearing blade guides held the blades' tracking true without deflecting. The quick-release tensioner makes blade changes quick and eases stress on the tires when not in use. A built-in mobile base is also included.

My only beef with this saw: the blade guard is obtrusive and impaired my ability to see the cutline. I had to raise it 1½" above the workpiece, dangerously exposing the blade.

—Tested by Doug Hicks

Doug Hicks taught high school woodshop for 5 years and has edited woodworking magazines and books for the past 24.

Performance		★★★★☆
Price	#50100G	$900

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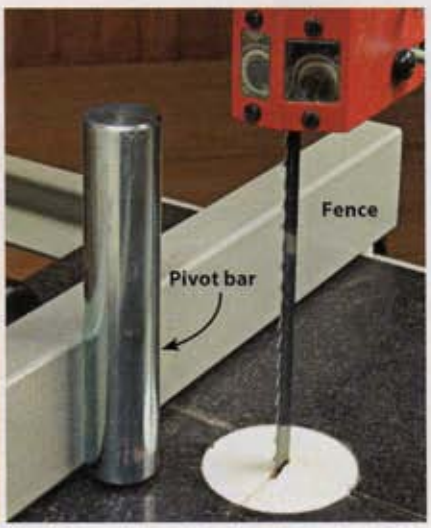

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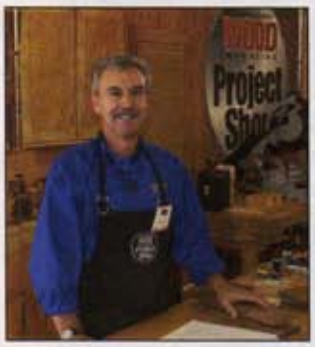

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Remove tough nails with this handy puller

Pulling nails with the claw of a hammer proves easy, but what about when you've broken off the head or there never was one? Enter The Extractor. This nail-pulling pliers combines long adjustable rubber-coated pliers-type, handles with parallel serrated jaws that tightly grip the nail.

I used The Extractor to remove various lengths and grades of headed nails, finish nails, brads, and staples. I really like it for pulling 23-gauge pins, something my hammer cannot do. It's also perfect for pulling old cut nails from reclaimed lumber without breaking them off. The Extractor left indentations in pine and even tough white oak, but I prevented that by inserting a scrap of ¼" hardboard between the board and tool before prying nails free.

—Tested by Bob Hunter, Tools & Techniques Editor

The Extractor, #HL-1121

Performance	★★★★☆
Price	$28

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Nifty Napkin Holder

Turn a few small cutoffs into a stunning centerpiece for your table.

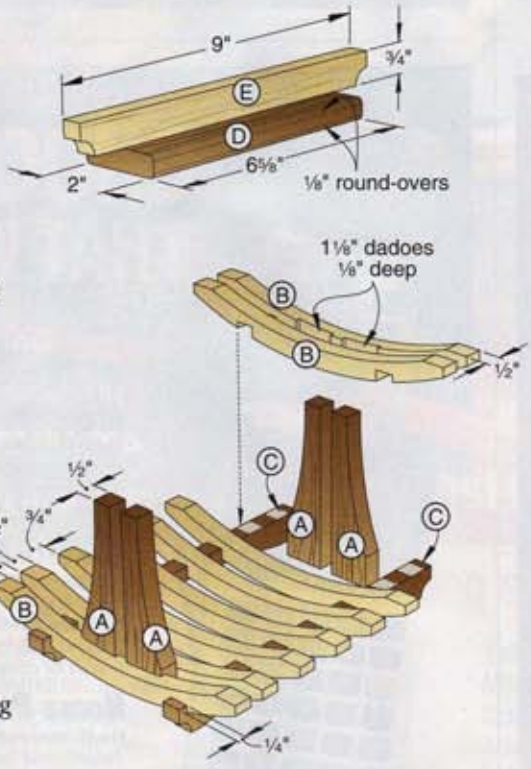
Project design: **Jeff Mertz**
Illustration: **Roxanne LeMoine**

Machine the parts

Make four oversize post blanks (A, 1¼×4⅝") from ½"-thick stock. Adhere to each blank a copy of the full-size pattern from the *WOOD Patterns®* insert on *page 45*. Cut these to shape with a bandsaw or scrollsaw, and then sand the edges smooth. (For quicker results stack the four blanks together with double-faced tape, and then machine them at the same time.)

Make eight 1¼×8" blanks from ½"-thick material for the rests (B). Adhere a full-size pattern to each; then cut dadoes where shown. Finally, cut the rests to shape and sand smooth.

Machine the feet (C) and retainer guide (E) to shape using the full-size pattern, and then sand them smooth. Cut the retainer (D) to size, and rout ⅛" round-overs along the top and bottom of both edges. Remove the patterns and sand all parts smooth to 220 grit.



Glue up the assembly

Glue and clamp the posts (A) into the dadoes on the outside rests (B), aligning the inside corner of the posts to the inside corners of the dadoes. Sand the posts to length **[Photo A]**.

Next, glue the end assemblies (A,B) onto the feet (C) **[Photo B]**. Place a rest (B) onto the feet tight against the inside faces of the posts (A). Glue the remaining rests to the feet spaced ¾" apart.

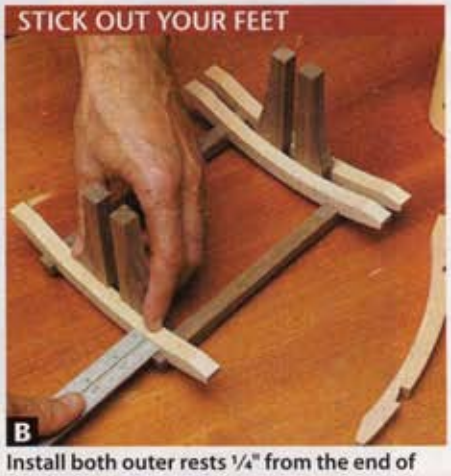
Glue the retainer guide (E) to the center of the retainer (D). Sand to 220 grit as needed, and then apply a clear finish of your choice. (We used three coats of aerosol polyurethane.)

FLUSH-FIT THE POSTS

A

Sand the bottom of the posts even with the bottom of the rests.

STICK OUT YOUR FEET



B

Install both outer rests ¼" from the end of the feet.

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Circle No. 661

6 Essential Machinery Setup Tools

Don't settle for "close enough" accuracy. Here's how to get hairsplitting precision.

Properly adjusted machines make better cuts and you can dial in peak performance on your stationary machines with this practical set of tune-up tools. Most cost under $20, and you can buy all of them for well under $200. See the chart on *page 24* for even more uses for each tool.

1 Combination square

In many shops, this multifunction tool finds use only when scribing a line across a workpiece. What a shame! You can use the head alone to set 45° and 90° angles on a tablesaw blade, miter gauge, or jointer fence. Lock the head in position on the rule to check the distance from a router bit to the router-table fence (*above*) or the height of a tablesaw blade. Hold the edge of the rule against the router-table fence to set a router-bit bearing flush. Prices start at about $15 and can run up to $75. (Generally speaking, price reflects reliability and accuracy.) In the *WOOD*® shop, we rely on a Starrett 12" model, shown *above*. ($75, item 30N03.01, Lee Valley, 800-871-8158, leevalley.com)

2 Adjustable triangle

Not every angle in woodworking measures 90° or 45°. For anything in between, add an adjustable triangle to your tool kit. Find one at an art-supply store for about $20.

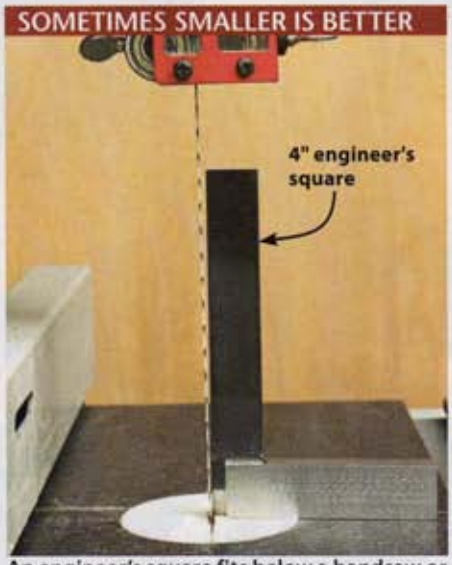
ACCURACY TO WITHIN ½°

The widely spaced half-degree increments and a fine-line red cursor on this adjustable triangle make setting precise angles easy.

3 Engineer's square

This miniature marvel squeezes into spaces where a bigger square can't. It fits in an apron pocket, so it's always at your fingertips for checking square on machine setups or workpiece edges after completing a cut. ($12.99, item 141014, Woodcraft, 800-225-1153, woodcraft.com)

SOMETIMES SMALLER IS BETTER



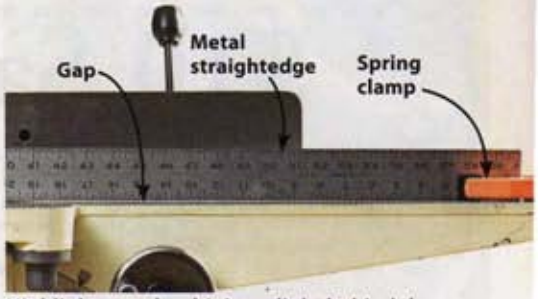
An engineer's square fits below a bandsaw or mitersaw blade guard. It stands on its wide handle, leaving your hands free.

4 Long straightedge

Tables and extension wings sag, cast iron warps, and moving machines around bumps them out of alignment. A straightedge helps you spot problems in surfaces that are supposed to be flat.

For these jobs, use a long metal rule that easily shows gaps and irregularities under its narrow edge. Simply clamp a spring clamp on one end, and it stands on edge, freeing your hands to fine-tune the machine. We found 48" and 60" steel rules at big-box lumberyards for $12–$15.

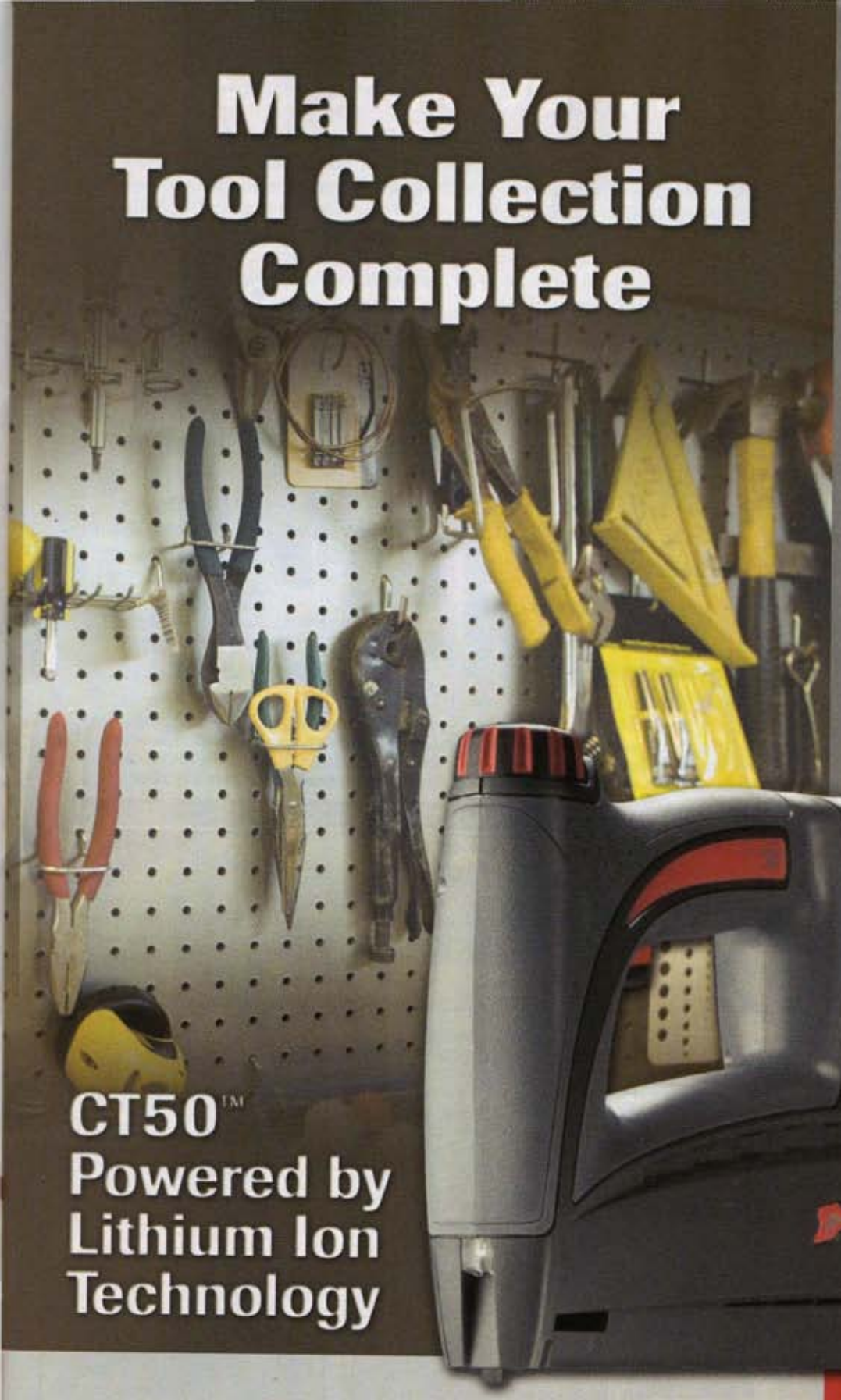
THE STRAIGHT-AND-NARROW WAY



Highlight gaps by shining a light behind the straightedge. In this case, the jointer bed needs to be raised at the cutterhead.

continued on page 24

Make Your Tool Collection Complete



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AD71 REV 1208

5 Dial indicator

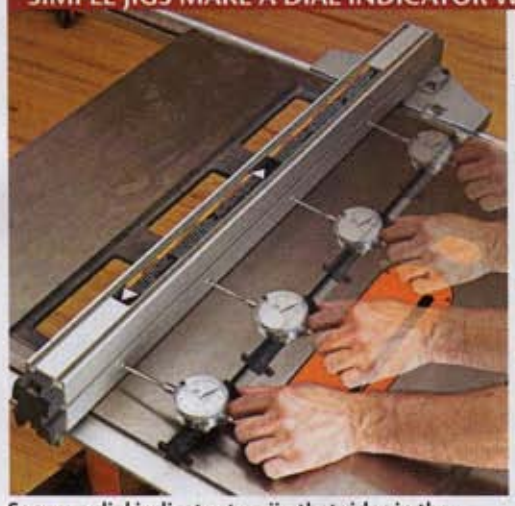
When checking a setup requires minuscule measurements, reach for a dial indicator. It shows increments as fine as 1/1000". You can spend a lot, but an inexpensive one will do the job.

A jig keeps the indicator stationary while taking measurements. Purchase one like the Super Bar (*below left*), or make your own for setting jointer knives (*below right*). Find a free plan for the jointer jig at woodmagazine.com/jointerjig. (Dial indicator, $12.95, item G1479, Grizzly Industrial, 800-523-4777, grizzly.com; Super Bar, $69, MasterGage Corp., 888-893-8300, mastergage.com)

6 Alignment plate

Mount this dead-flat, machined plate in place of a saw blade in your tablesaw, radial-arm saw, or mitersaw. It provides a longer, truer surface than a saw blade for taking measurements and checking setups. (Master Plate, $49, MasterGage Corp., 888-893-8300, mastergage.com)

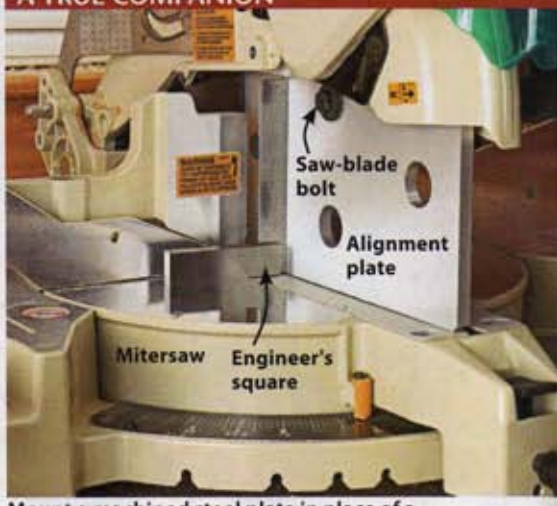
SIMPLE JIGS MAKE A DIAL INDICATOR WORK FOR YOU



Secure a dial indicator to a jig that rides in the miter-gauge slot. Then slide it along the slot to check your rip fence for parallel.

Compare the measurement taken on the outfeed table with measurements taken on the knives to ensure all are the same height.

A TRUE COMPANION



Mount a machined steel plate in place of a blade to check saw alignments. The plate is perfectly flat from one edge to the other.

HOW & WHERE TO USE 6 ESSENTIAL MACHINERY SETUP TOOLS

	12" Combination Square	Adjustable Triangle	4" Engineer's Square	48–60" Metal Straightedge	Dial Indicator	Alignment Plate
Tablesaw	Set blade square to table; check fence for square to table; check that table and fence are parallel to blade; set blade 45° to table; set blade height	Set blade tilt; set angle of miter gauge	Check fence for square to table; set blade square to table	Check table and extension wings for flatness; check fence for flatness	Check blade and fence for parallel to miter-gauge slot; check run-out (wobble) on blade and arbor	Use with dial indicator to set blade parallel to miter slot
Bandsaw	Check 45° table-tilt stop and 90° stop for accuracy	Set tilt of table	Check table for square to blade; verify 90° stop	Align wheels to each other		
Jointer	Check fence angle; set stops at 45° and 90°	Position fence angle for bevels	Check fence and 90° stop for square to table	Set tables parallel; check tables for twist; check outfeed table height	Set knives flush with outfeed table	
Planer	Measure thickness of planed stock to set thickness indicator			Set infeed, outfeed tables flat and flush		
Drill Press	Check table for square to bit; set table 45° to bit	Set table tilt angle	Check table for square to bit		Check quill and chuck for run-out (wobble)	
Mitersaw	Check blade for square to fence; check 45° bevel	Set miter angle of blade to fence	Verify blade is square to table; check that blade is square to fence	Check table and extension wings for flatness and flush		Check blade for square to table and fence
Router Table	Set bit height; align fence with bit bearing; set distance from bit to fence		Check fence for square to table	Check table and fence for flatness	Measure fine fence and bit-height adjustments; set bit height	
Radial-Arm Saw	Check blade for square to fence	Set miter angle of blade to fence	Confirm blade and table are square to each other	Check table and extension wings for flatness and flush	Check blade run-out (wobble)	Check blade for square to table and fence

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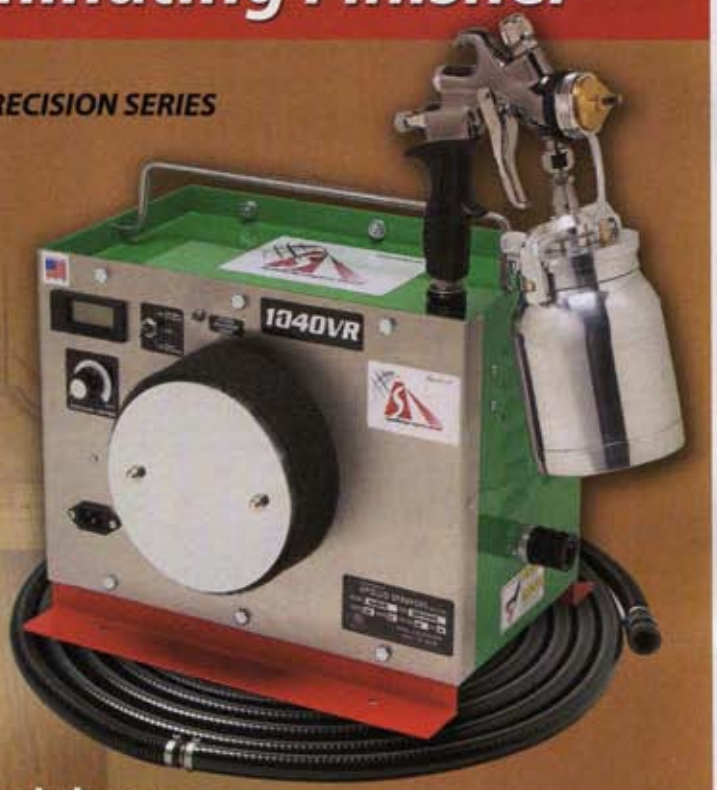

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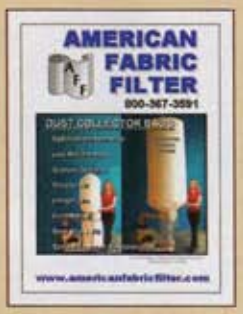

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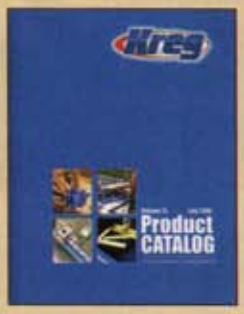

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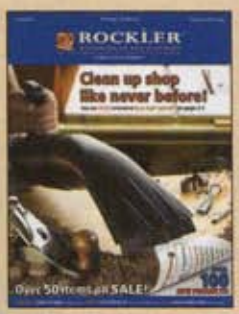

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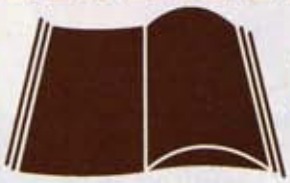

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Our Editor Tests

Why buy?
With one of these accessories, you'll end the annoying under-the-table fumbling for your router's power switch. Simply plug your router into the outlet on the auxiliary switch, lock the router switch in the "on" position, and you're ready to go. Tool and Techniques Editor Bob Hunter tried out a number of accessory switches, and recommends the three shown here.

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★★★★★ Top of the line ★★★★ Solid performer for the price

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—Tested by Bob Hunter
3 years as an editor at *WOOD*® magazine, 24 years of woodworking experience

ROUSSEAU, #3506, $40

Editor rating: ★★★★★

Editor test-drive:
Although this one costs more than the others, it's worth it. The low-profile rocker switch prevents accidental start-ups, and the 6"-long yellow "crash bar" proves easy to locate without looking to shut down the router. I like its compact steel box with steel angle bracket for easy, sturdy mounting to the stand or the top. Either way, it's unobtrusive while still easy to reach. The 8½'-long power cord—the longest in the test—features 14-gauge wire with insulation coating that stays flexible even in 40° conditions. And the outlet on the bottom of the box allows the router cord to hang straight down without getting in the way of my stance when I'm routing a workpiece.

To learn more:
800-635-3416; rousseauco.com

ROCKLER, #20915, $36

Editor rating: ★★★★★

Editor test-drive:
This model's big stop-sign "off" switch proved the easiest to reach and find without taking my eyes off the spinning router bit. And nestled above the STOP switch, the recessed "start" switch prevents accidental startups, but is still easy to locate without looking. The Rockler switch has a 7' power cord (with 14-gauge wire) that exits the box from the bottom, and instead of an outlet, there's a handy 2' pigtail cord for plugging in the router. Mounting the switch to my 5-year-old Rockler router table required drilling one hole through the steel leg because the predrilled holes did not line up with the box. (Rockler tells us newer tables match up perfectly.)

To learn more:
800-279-4441; rockler.com

MLCS, #9079, $25

Editor rating: ★★★★

Editor test-drive:
At first, I didn't like this switch because it works best on the left-hand side of a router table, and I'm right-handed. Because the cord exits the box from the center of its left side, it kept getting in my way when I mounted it on the table's right side. After relocating it to the left side, to my surprise, it quickly felt natural to reach to my left to power down (just as on my tablesaw). I don't like the standard toggle switch as well as the others—there's no quick-find kill switch—but it does have a removable key to lock out power. Although the cord features lighter-weight 18-gauge wire, it never got hot or became an issue, no matter what size router or bit I used.

To learn more:
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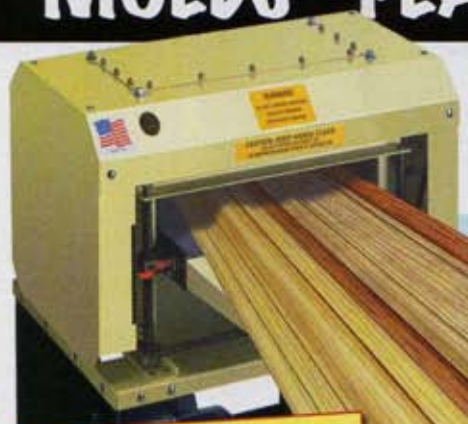

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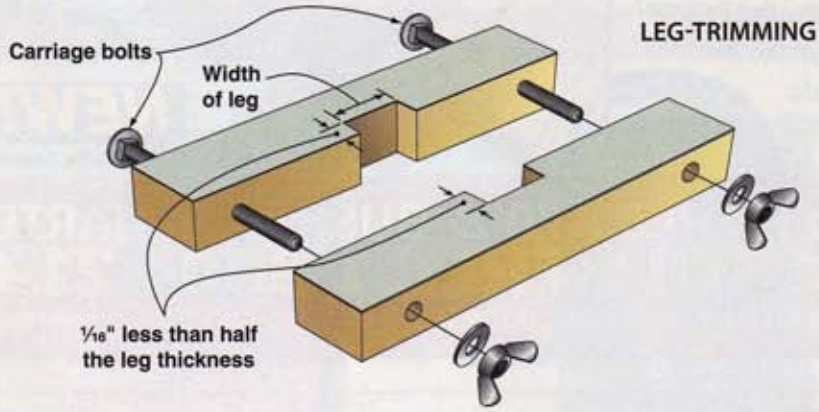
Equalize Uneven Legs

No matter how precisely you cut table legs to length, nor how carefully you glue up the legs, aprons, and top, your four-legged table may still rock or wobble a bit. Just the act of attaching the top can pull one or more of the legs out of alignment. If it happens to your table, don't panic: Here's a simple way to wipe out wobble the first time.

The trick in solving this rocky problem: Remember that three points describe a plane. That's why a three-legged stool or tripod won't rock, but a four-legged table might. To determine whether your table will rock, first stand it on a dead-flat surface, such as your tablesaw top. If it wobbles, look for the two long legs that are diagonally opposite from each other. To remove the wobble, you need to trim the longer of these two legs. Position the table on the saw and then score lines on the "long" leg, as shown [**Photos A, B**].

If the score lines are less than about 1/16" from the bottom end of the leg, it may be easiest to just sand off the excess, as shown in the *top* photo. Stick a piece of 80-grit adhesive-backed sandpaper to the top of your tablesaw, then work the long leg back and forth on the sandpaper to remove the excess.

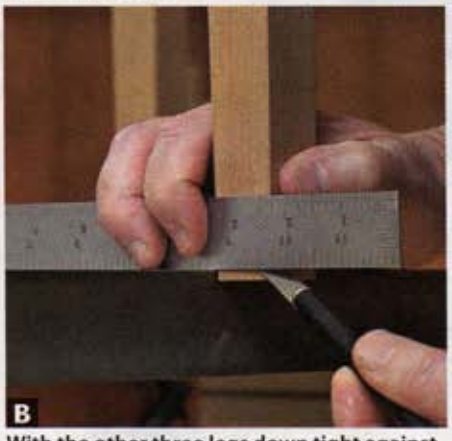


If you have to remove more than 1/16", make a leg-trimming jig, shown *above*, that clamps onto the leg right at the score lines. We made this one from scraps of melamine because it has a smooth, slick surface, but you could use any hardwood.

With the cutting guide in place, use a sharp, low-angle block plane or a flush-cut saw [**Photo C**] to trim the leg on the score lines. (*Note:* If you're using a block plane on a thin leg, clamp the leg securely in a vise or get a third hand for added support.)

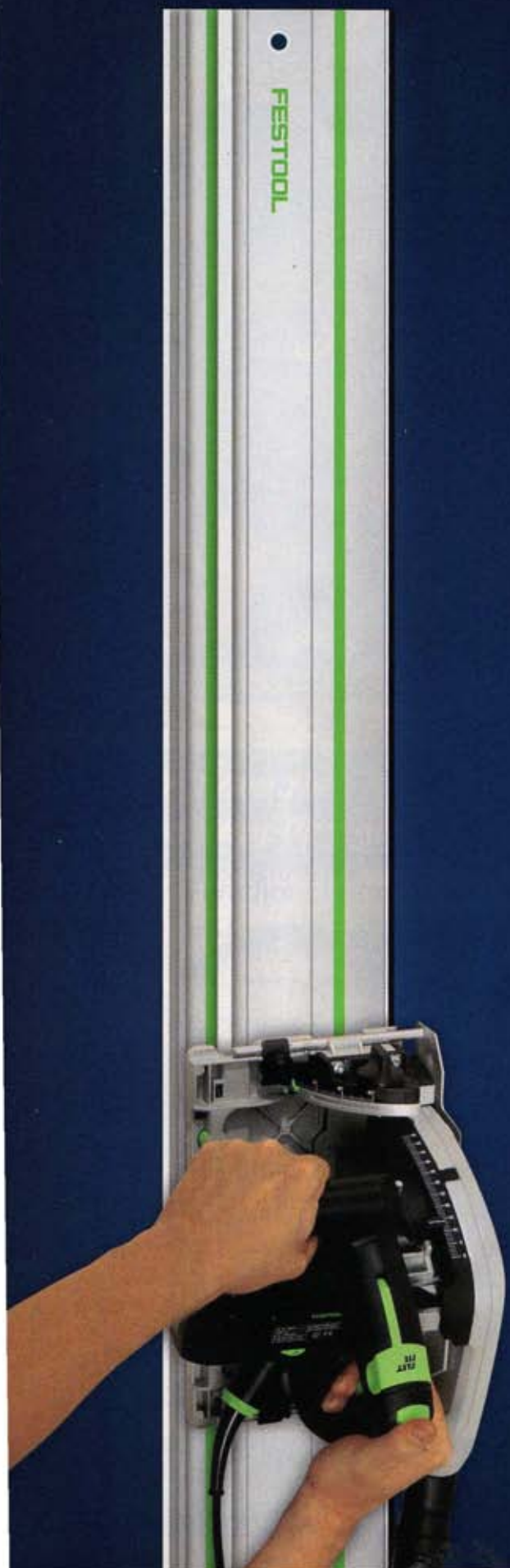
Finally, check the table once again on the top of your saw for wobble. If it's close, finish it off using the sandpaper method described previously.

After determining which are the long legs, hang one over the edge of a reliably flat surface. (In most shops, a cast-iron tablesaw top or large shaper table fills the bill better than a wooden benchtop.)



With the other three legs down tight against the top of the tablesaw, set a straightedge on top of the saw. Then score a line on the leg along the bottom of the straightedge. Repeat on the opposite face.

For removing 1/16" or more, clamp the cutting guide around the leg so its top aligns with the score lines on the leg. Hold a flush-cut saw flat against the top of the cutting guide and trim the leg along the score lines.



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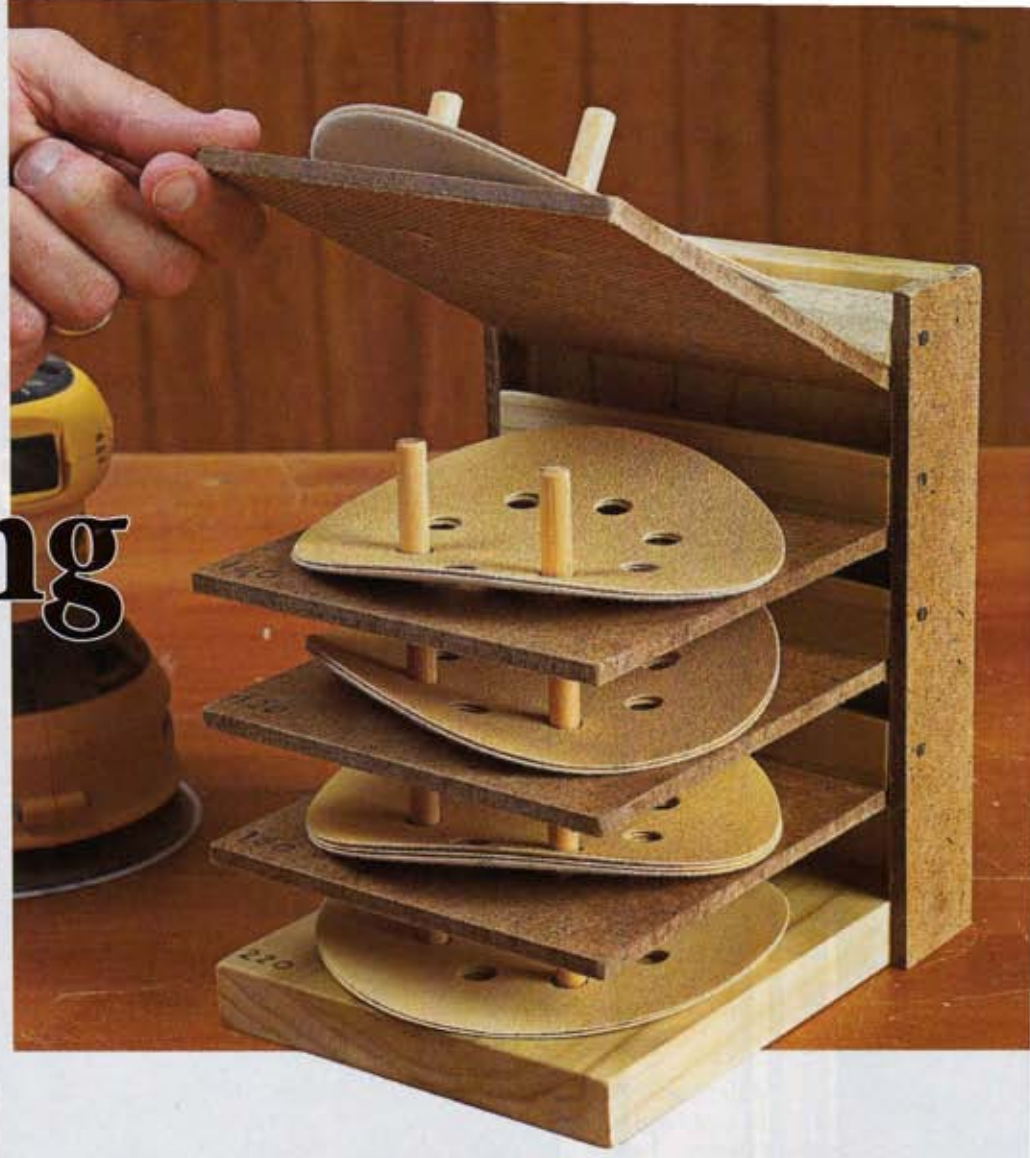
Great Ideas for Your Shop

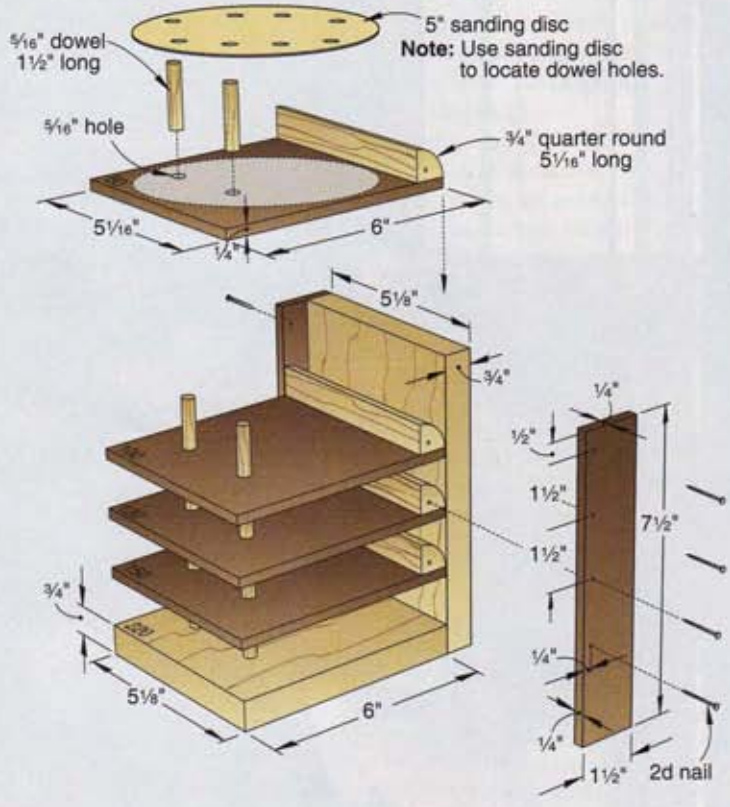
Flip-up Sanding Disc Caddy



While sanding a table, *WOOD*® magazine reader Charlie Walsh of Shelton, Wash., got tired of looking through boxes of sanding discs and having the different grits spread out over his workbench. So he made a few sketches, and presto, in less than 30 minutes he built this project he calls the "Sand-Which"—a caddy with flip-up shelves that organizes, stores, and provides easy access to all his sanding discs. Charlie keeps his caddy on his workbench, but you could easily wall-mount it.

Use the drawing to build your own "Sand-Which." Adjust the number of shelves, if you like, for however many sanding grits you typically use.

Find more shop organizer plans at:
woodmagazine.com/freeplans



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A 7-drawer delight

Lingerie Chest

Assemble the case quickly using glue and biscuits, and then machine the drawer parts with simple tablesaw setups.

Overall dimensions:
22¼" wide × 21¼" deep × 58" high.

PROJECT HIGHLIGHTS

- Materials needed: Cherry, soft maple, cherry plywood, birch plywood.
- Good alternate choices for the primary wood include maple and ash.
- The chest matches the pencil-post bed, nightstand (both in issue 187), dresser, valet, and wall mirror (all in issue 188) to create a complete bedroom suite.

Seven spacious drawers in this lithe Shaker-style chest create a piece of furniture that's as practical as it is beautiful. It completes the bedroom suite that started with the pencil-post bed and matching nightstand in the November issue.

Start with the legs

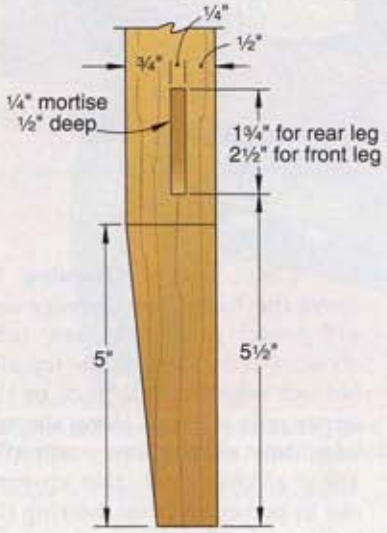
1 Cut four legs (A) to size [**Materials List**, *page 40*]. You can cut them from solid stock or laminate thinner stock. Mark the position of each leg on its top (FL for front left, for example).

2 Lay out the tapers on the two inside bottom faces of each leg (A) [**Drawing 1**]. Using a tablesaw and tapering jig, cut the tapers [**Photo A**]. (Buy plans for a simple tapering jig at woodmagazine.com/taperingjig.) Sand to remove saw marks, and round over the bottoms.

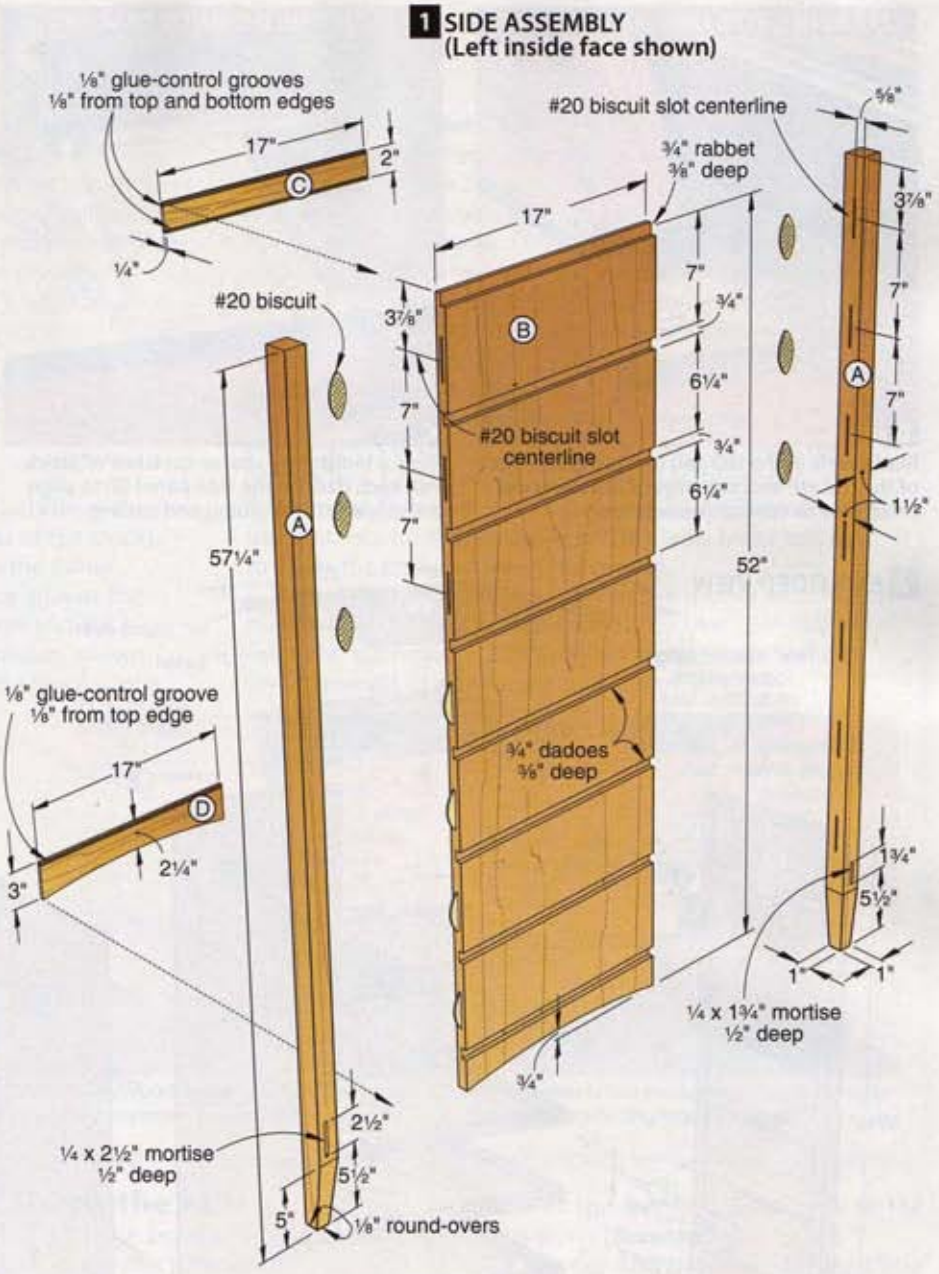
3 Lay out the locations of the mortises for the front rail (F) and back rail (G) on the legs (A) [**Drawings 1, 1a**]. Form the mortises by drilling a ¼" hole ½" deep at each end of each mortise. Then drill evenly spaced holes between them to remove the waste. Clean out the mortises and square the corners with ¼" and ¾" chisels.

Saw tapers on the inside faces at the bottom of each leg (A). The straight sides face out at each corner.

1a LEG MORTISE DETAIL (Left rear/right front leg shown, right rear/left front leg is mirror image)



1 SIDE ASSEMBLY (Left inside face shown)



Make the side panels

1 Cut the side panels (B) to size. ***Quick tip: Don't wrestle with big sheets.*** Rough-cut the plywood sheet into slightly oversize blanks with a circular saw. (The plywood dealer might break down the sheet for a nominal charge, too.) Then, rip and trim the panels to final size on your tablesaw.

2 Cut seven ¾×⅜" dadoes and one ¾×⅜" rabbet in the inside face of each side panel (B) [**Drawing 1**].

3 Mark the centerpoint of the arc on the bottom of each side panel (B) [**Drawing 1**], and then draw a line through it and the endpoints with a fairing stick. (For a free video and fairing stick plan, go to woodmagazine.com/fairingvideo.) Bandsaw the arc slightly outside the line, and sand to the line.

4 Lay a side panel (B) on your workbench, dadoed side up, and then position the front and back legs (A) for that side flush with the panel at the top. Mark biscuit locations on the side panel, centered between the dadoes and rabbet [**Drawing 1**], and mark the corresponding locations on each leg. Repeat for the other side panel and legs.

5 Adjust your biscuit joiner fence to center #20 biscuit slots on the edges of the side panels (B) ⅜" from the inside (dadoed) face. Plunge slots at the marked locations on the panels. Finish-sand the side panels to 220 grit.

Build the case sides

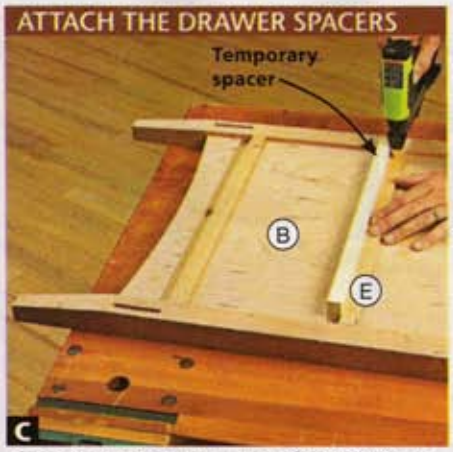
1 Adjust your biscuit joiner fence to center a #20 biscuit slot ⅝" from the inside edge of the legs (A) [**Drawing 1**]. Plunge slots at the marked locations. Finish-sand the legs, using a flat sanding block to prevent rounding the faces.

2 Cut the upper rails (C) to size [**Drawing 1**]. Cut two blanks ¼×3¼×17" for the lower rails (D); the extra width facilitates trimming the bottom arcs.

3 Mark the endpoints and centerpoint of the arc on the lower rail (D) [**Drawing 1**], and lay out the arc through the three points. ***Quick tip: Stack-cut parts to save time.*** You can lay out the arc on one blank, and stack-cut both rails. Stack the blanks with all edges flush, and fasten them together with masking tape or double-faced tape. Bandsaw about ⅛" outside the line, but do not sand the curve to the line.

4 Glue and clamp the upper rails (C) flush with the top of the side panels (B) and the lower rails (D) overhanging the bottoms of the side panels by ⅛". Align both ends of each rail flush with

Blade kerfs in the top and bottom back edges of the top rail and top edge of the lower rail catch glue to control squeeze-out.

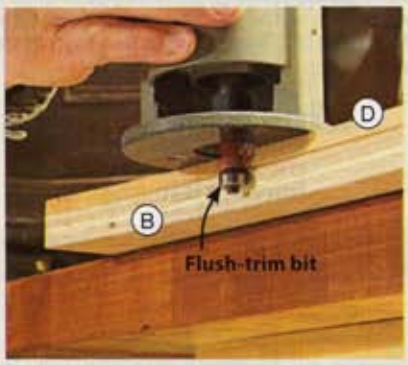


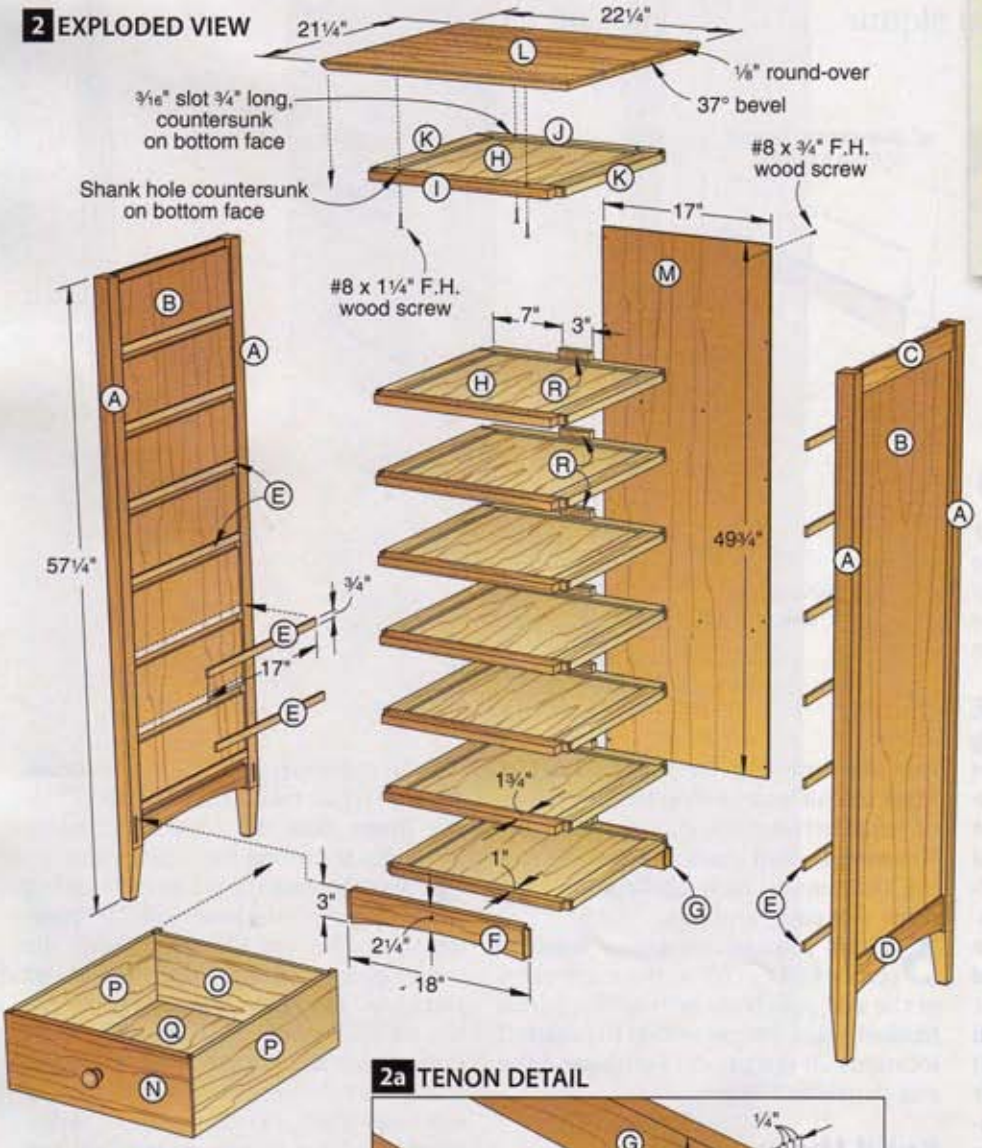
Place a temporary spacer cut from ¾" stock into each dado in the side panel (B) to align the spacers (E) for gluing and nailing.

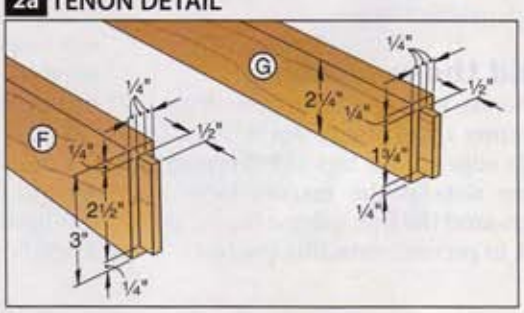
SHOP TIP

Match edges exactly with a flush-trim router bit

Easily trim the overhanging edge of the lower rail (D) to the same curvature as the arc in the side panel (B) with a flush-trim bit in your handheld router. Adjust the cutting depth so the pilot bearing on the bit rides along the bottom edge of the side panel. Keep the bearing firmly against the bottom edge of the side panel to neatly trim the lower rail.







the panel edges [**Drawing 1**]. ***Quick tip: Keep glue squeeze-out off panel faces.*** Cut saw kerfs about ⅛" deep ⅛" from the top and bottom edges on the back of the upper rails (C) and along the top edge only on the lower rails (D). These grooves catch glue squeeze-out to prevent it from marring the side panels (B) when you glue on the rails [**Photo B**].

5 Trim the bottom edges of the lower rails (D) flush with the side panels (B) [**Shop Tip**, *above*]. Finish-sand the rails (C, D) and touch-up sand the side panels.

6 Apply glue to the biscuit slots in the legs (A) and one side assembly (B/C/D). Run a bead of glue along the edges of the side panel (B) near the dadoed face to minimize squeeze-out on the outside face. Lay the side assembly, dadoed face down, on ¼" spacers on your workbench. Insert biscuits in the panel slots, assemble, and clamp, keeping the tops of the legs and the side panel flush [**Drawing 2**]. The mortises in the legs should face down. Repeat to assemble the other side.

7 Cut the drawer spacers (E) to size. Align the spacer bottoms

SKILL BUILDER

Size panel rails to plywood thickness for pro results

Plywood usually measures less than its stated (nominal) thickness. When you build a framed panel, such as the dust panels (H/I/J/K), the plywood should fit snugly into grooves in the frame members. Stub tenons on the end rails must fit the grooves, too. Here's how to make the parts fit together:

First, measure the actual thickness of the plywood, shown *below*. For plywood thicker than ¼" (.250"), you can then shim a dado stack to cut a groove the correct width. Here, the plywood dust panel (H) measures less than ¼", so cut overlapping kerfs with a tablesaw blade. You can take either of two approaches, depending on whether you prefer starting with cuts or calculations:

Trial-and-Error

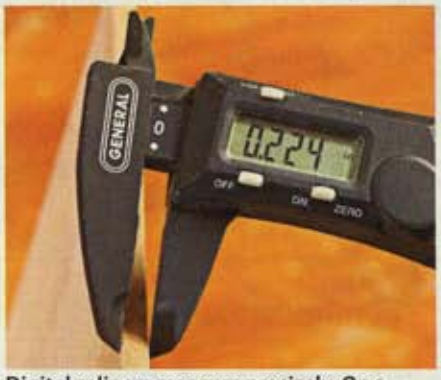
Position the rip fence about 7/16" from the outside of the blade (slightly more than half the thickness of the stock). Then, in scrap stock the same thickness as the frame members, cut a ¼"-deep kerf with one face against the fence, and then rotate the piece end for end and cut another kerf. Test-fit the plywood in the groove, shown *center*. If the groove is too narrow, move the fence a little farther from the blade. When you have fine-tuned the width, cut the grooves in the rails (I, J, K).

To cut the centered stub tenons on the end rails (K), set the tablesaw cutting height at ¼", and place the fence ¼" from the outside of the blade. Then, on scrap stock the same thickness as the frame members, cut rabbets on both faces of one end, and test-fit the tenon, shown *below*. If it is too thick, raise the cutting height slightly, and recut. When the tenon fits, cut the tenons on both ends of each end rail (K).

Measurements-and-Math

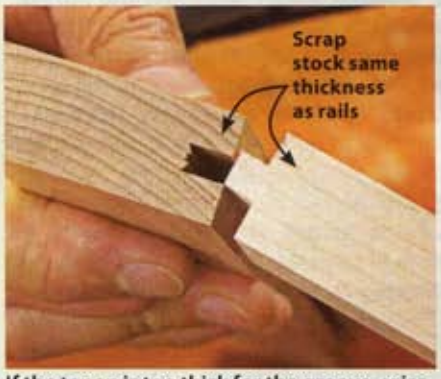
Subtract the plywood thickness (ours measured .224") from the thickness of the rail (I, J, K) stock (.750"). Divide the remainder (.526") by two (.263") and add the plywood thickness to the result (.487", or about 31/64"). Place the fence that distance from the outside of the blade. Make test cuts to verify the plywood fits in the groove.

To find the rabbet depth, subtract the groove width from the thickness of the stock, and divide by two. (For this example, cut rabbets .263", or 17/64", deep.) Make test cuts on scrapwood to achieve the best tenon fit.



Digital calipers measure precisely. On a fractional scale, measure to 64ths, at least.

Test the plywood in the groove, and judge how much to move the fence for good fit.



If the tenon is too thick for the groove, raise the dado blade slightly and recut.

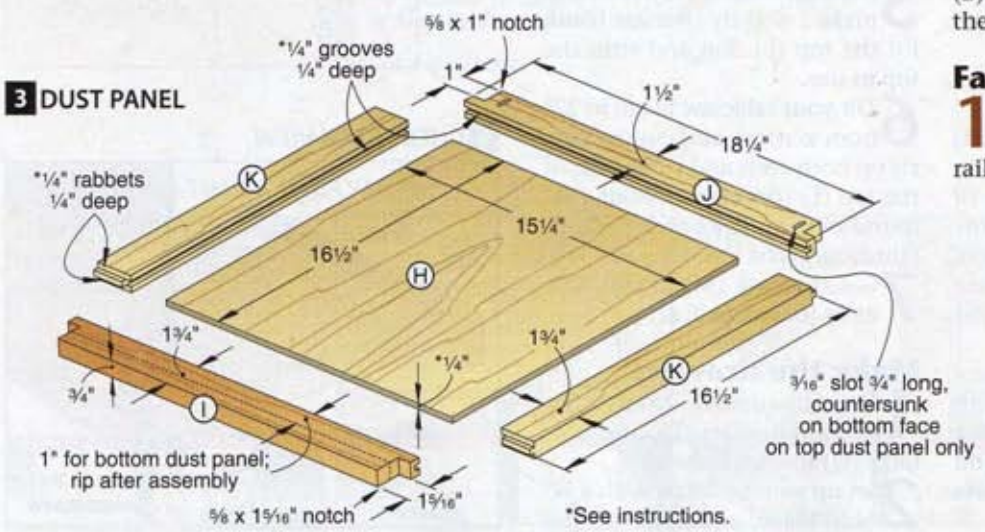
flush with the dadoes in the side panels (B). Glue them to the side assemblies (A/B/C/D) and fasten with a pneumatic brad nailer, pinner, or ½" wire nails [**Drawing 2**, **Photo C**].

Shape the rails

1 Cut the front rail (F) and back rail (G) to size [**Drawing 2**].

2 Install a ½" dado set on your tablesaw and adjust the cutting depth to ¼". Cut the tenons on the ends of the rails (F, G) [**Drawing 2a**].

3 Lay out and bandsaw the arc along the bottom edge of the front rail (F) [**Drawing 2**] as you did for the side panels (B) and lower side rails (D). Finish-sand the front and back rails to 220 grit.



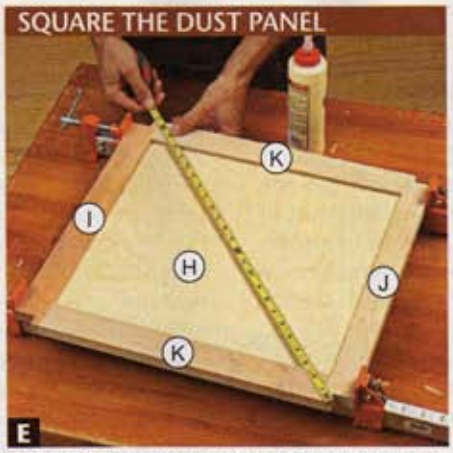
Fabricate the dust panels

1 Cut the dust panels (H), dust panel front rails (I), back rails (J), and end rails (K) to size [**Drawing 3**].

2 Cut a groove ¼" deep to fit the dust panel (H), centered on the edge of the dust panel front, back, and end rails (I, J, K) [**Drawing 3**, **Skill Builder**, *above*].

3 Cut ¼"-long stub tenons on the ends of the dust panel end rails (K) to fit the grooves in the front and back rails (I, J) [**Drawing 3**, **Skill Builder**, *above*].

Set the tablesaw fence as a stop for the 5/8" length of the notch. A miter-gauge extension supports the rail (I, J) for cutting.



Glue and clamp the dust panel (H/I/J/K), and measure both diagonals. The panel is square if the measurements are equal.

For the shallow bottom dust panel (H/I/J/K), rip the front (cherry) rail (I) on one dust panel to 1" wide.

4 Attach an extension to your miter gauge, and notch the ends of the dust panel rails (I, J) [**Drawing 4**] with the dado set in several passes [**Photo D**].

5 Arrange a dust panel (H) and rails (I, J, K) in assembly order on your bench [**Drawing 3**]. Apply glue in the rail grooves, assemble the dust panel, and clamp, checking for square [**Photo E**]. Construct the remaining seven panels the same way.

6 Rip ¾" off the front rail (I) of one dust panel (H/I/J/K) [**Drawing 3, Photo F**] to make the bottom dust panel [**Drawing 2**]. Finish-sand the panel.

7 On the bottom of the top dust panel (H/I/J/K), drill and countersink screw holes to attach the top (L) [**Drawings 2, 5**]. (For #8 screws, drill 5/32" shank holes and 7/64" pilot holes.) To allow wood movement in the top, enlarge the holes in the dust panel back rail (J) into slots about ¾" long [**Drawing 5**]. ***Quick tip: When you're slottin', just keep rockin'.*** Drill through each back-rail hole with a 3/16" twist drill, then rock the bit back and forth to form the slot. Elongate the countersinks also. Finish-sand the remaining dust panels.

Construct the case

1 Lay one side assembly (A/B/C/D/E) on padded sawhorses or benchtop, dadoes facing up. Without gluing, fit the bottom dust panel (H/I/J/K), the shallow one, into the bottom dado of the side assembly [**Drawing 2**]. Place another dust panel temporarily in the middle dado.

2 Without gluing, insert the tenon of the front rail (F) into the mortise in the front leg (A) [**Drawing 2**]. Then, place the other side assembly on the rail and dust panels. Check the fit of all parts [**Drawings 2, 6**].

3 Lift off the side assembly (A/B/C/D/E) on top, and remove the front rail (F). Apply glue to the *front edge only* of the bottom dust panel (H/I/J/K). Then, put the front rail back in position and replace the side assembly on top. Square the case, clamp the sides, and then clamp the front rail to the dust panel [**Photo G**].

4 After the glue dries, lift off the side assembly (A/B/C/D/E) on top, the front rail/bottom dust panel assembly (F/H/I/J/K), and the other dust panel (H/I/J/K). Apply glue to the rabbet, dadoes, and mortises in the side assembly on the sawhorses. Then, with a helper, position the front rail/bottom dust panel assembly, the back rail (G), the top dust panel, and the six remaining dust panels on the side assembly [**Drawing 2**]. Apply glue and install the other side assembly. Square the case assembly, and clamp [**Photo H**].

5 Joint and edge-glue ¾" stock to make a slightly oversize blank for the top (L). Rip and trim the top to size.

6 Tilt your tablesaw blade to 37° from vertical, and cut the bevels on both ends and front edge of the top (L) [**Drawing 2**]. Rout a 1/8" round-over on the beveled edges. Finish-sand the top.

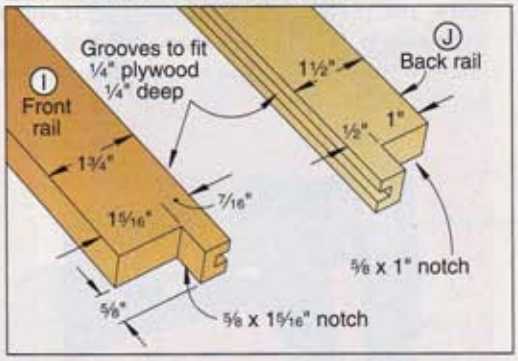
7 Cut the back (M) to size. Test its fit [**Drawings 2, 6**].

Make the drawers

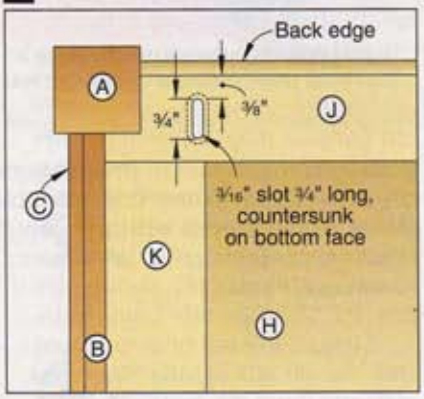
1 Cut the drawer fronts (N), backs (O), sides (P), and bottoms (Q) to size [**Drawing 7**].

2 Set up your tablesaw with a ¼" dado blade, and machine the

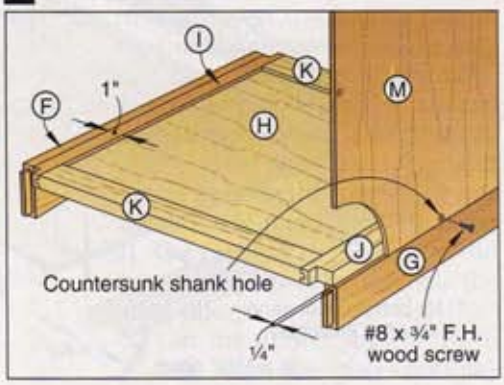
4 DUST PANEL RAILS DETAIL



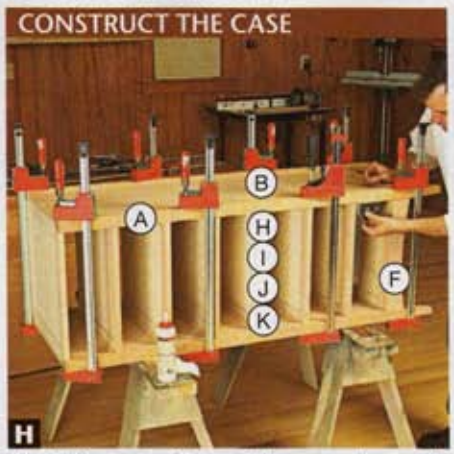
5 TOP DUST PANEL DETAIL



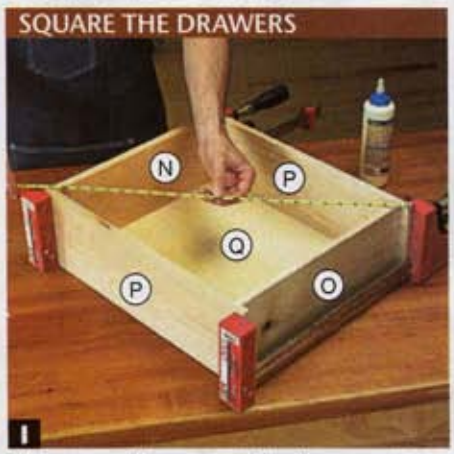
6 CHEST BACK VIEW



Glue and clamp the dust panel front rail (I) to the back of the front rail (F), making sure the top surfaces are flush.



Check for square frequently as you glue and clamp the case. Clamp the assembly evenly at the front and back.



After assembly, measure the drawer across both diagonals to ensure square. Adjust as needed, and clamp.

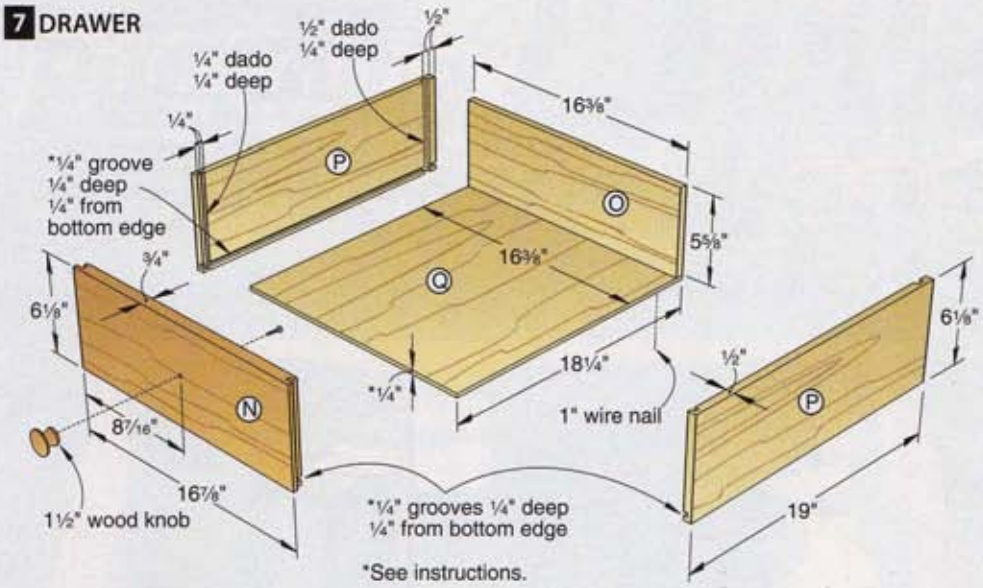
fronts (N) and sides (P), as shown in Steps 1–3 of **Drawing 8**. Change to a ½" dado blade, and make the cut at the back of the drawer sides, as shown in Step 4.

3 Cut a groove as wide as the thickness of the plywood drawer bottom (Q) in the drawer fronts (N) and sides (P). Locate the top of the groove 5⅝", or the width of the drawer back (O), from the tops of the fronts and sides [**Drawing 7**].

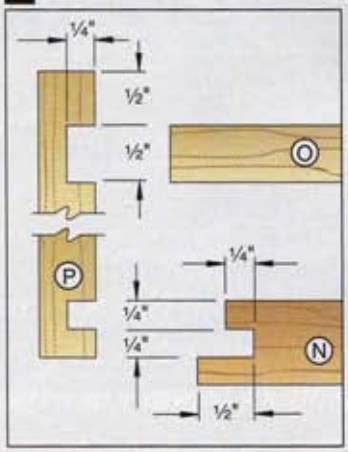
4 Glue the drawer fronts (N) and backs (O) to the sides (P) [**Drawings 7, 9**]. Slide the bottoms (Q) into the grooves in the sides and fronts, but do not glue them. Square the drawers, and then clamp the joints [**Photo I**]. After the glue dries, secure the bottoms to the backs with 1" wire nails.

5 Lay out and drill mounting holes in the drawer fronts (N) [**Drawing 7**], sized for the knobs you have chosen. Finish-sand the drawers.

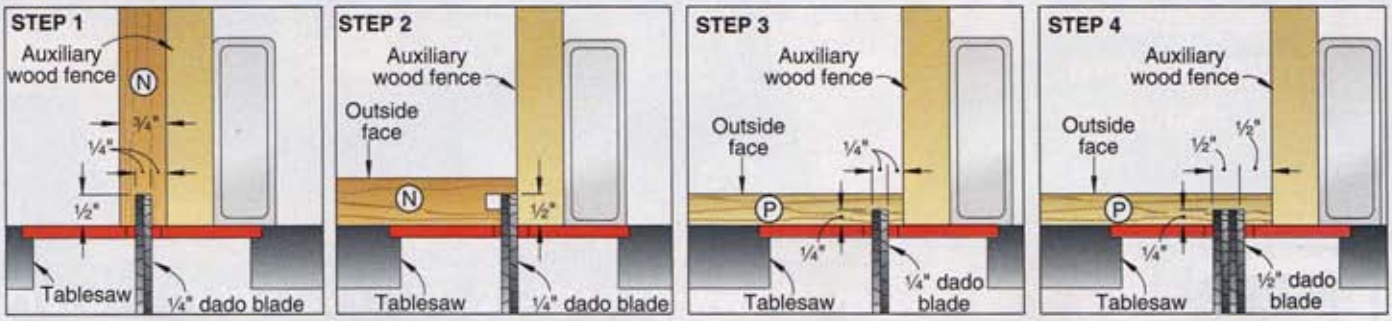
7 DRAWER



9 DRAWER-JOINT DETAIL



8 MACHINING THE DRAWER PARTS



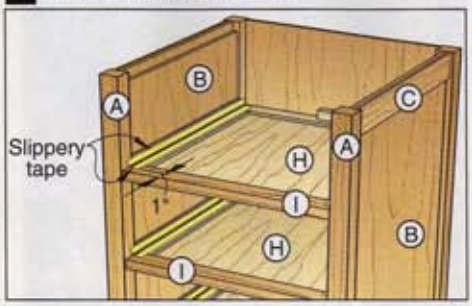
Complete the dresser

1 Cut the drawer stops (R) to size, and attach them to the dust panel back rails (J), where shown [**Drawing 2**]. Apply low-friction tape to help the drawers slide smoothly [**Drawing 10**].

2 Inspect the case and drawers, and touch up the finish-sanding as necessary. Stain as desired. (We stained the chest with Minwax no. 607 Cherrywood gel stain to match other pieces in the bedroom suite.)

3 Apply a clear finish. (We applied three coats of satin polyurethane, sanding to 320 grit between coats.)

10 SLIPPERY-TAPE DETAIL



4 Install the drawer pulls. Then slide the drawers into place.

Written by **Larry Johnston** with **Kevin Boyle**
Project design: **Kevin Boyle**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
Side assemblies						
A	legs	1½"	1½"	57¼"	C	4
B	side panels	¾"	17"	52"	CP	2
C	upper rails	¼"	2"	17"	C	2
D*	lower rails	¼"	3"	17"	C	2
E	drawer spacers	¼"	¾"	17"	C	14
Case						
F	front rail	¾"	3"	18"	C	1
G	back rail	¾"	2¼"	18"	C	1
H	dust panels	¼"	15¼"	16½"	BP	8
I	dust panel front rails	¾"	1¾"	18¼"	C	8
J	dust panel back rails	¾"	1½"	18¼"	SM	8
K	dust panel end rails	¾"	1¾"	16½"	SM	16
L*	top	¾"	21¼"	22¼"	EC	1
M	back	¼"	17"	49¾"	CP	1
Drawers						
N	fronts	¾"	6⅛"	16⅞"	C	7
O	backs	½"	5⅝"	16⅜"	SM	7
P	sides	½"	6⅛"	19"	SM	14
Q	bottoms	¼"	16⅜"	18¼"	BP	7
R	drawer stops	¾"	¾"	3"	SM	7

*Parts initially cut oversize. See the instructions.

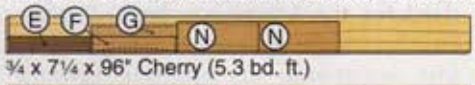
Materials key: BP–birch plywood, C–cherry, EC–edge-glued cherry, CP–cherry plywood, SM–soft maple.
Supplies: #8x¾, 1¼" flathead wood screws, #20 biscuits, 1½" wood knobs (7), 1" wire nails.
Blade and bits: ⅛" round-over bit, rabbeting bit, flush-trim bit, dado set.

Source

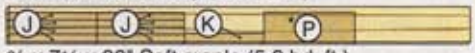
Low-friction tape: Slippery tape, 25U04.01, $12.50, Lee Valley, 800-871-8158 or leevalley.com.

Cutting Diagram

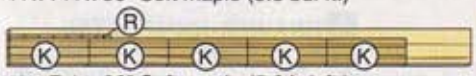
¾ x 7¼ x 96" Cherry (5.3 bd. ft.) (2 needed)
*Plane or resaw to the thicknesses listed in the Materials List.



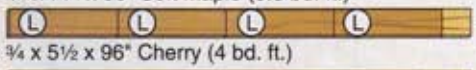
¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



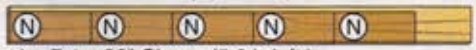
¾ x 7¼ x 96" Soft maple (5.3 bd. ft.)



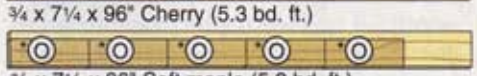
¾ x 7¼ x 96" Soft maple (5.3 bd. ft.)



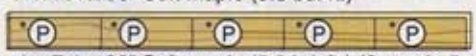
¾ x 5½ x 96" Cherry (4 bd. ft.)



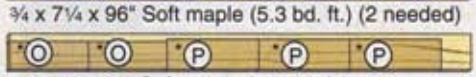
¾ x 7¼ x 96" Cherry (5.3 bd. ft.)



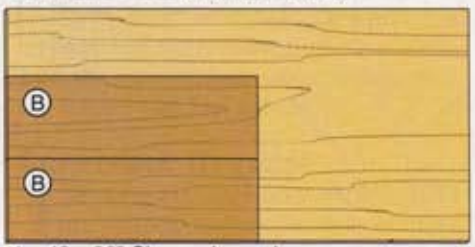
¾ x 7¼ x 96" Soft maple (5.3 bd. ft.)



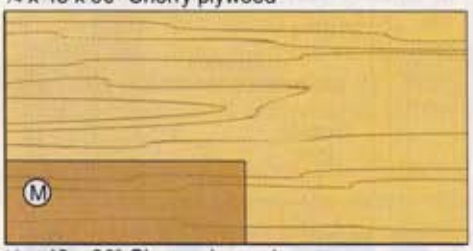
¾ x 7¼ x 96" Soft maple (5.3 bd. ft.) (2 needed)



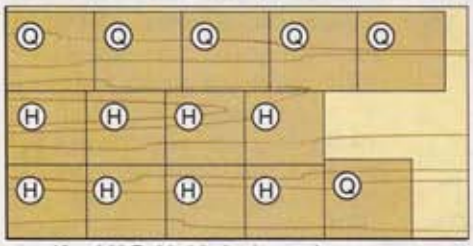
¾ x 7¼ x 96" Soft maple (5.3 bd. ft.)



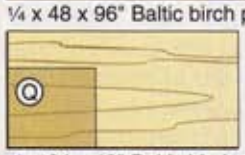
¾ x 48 x 96" Cherry plywood



¼ x 48 x 96" Cherry plywood



¼ x 48 x 96" Baltic birch plywood



¼ x 24 x 48" Baltic birch plywood

Download plans for the other pieces in this set at
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LEARN TO TURN

How to Use Scrapers and Parting Tools

Among turning tools, gouges usually receive the star billing. But parting tools and scrapers play key supporting roles.

See a free video of scraper techniques and sharpening at woodmagazine.com/videos

Scrapers, which date back to the earliest days of woodturning, still come in handy for modern turners in tasks as diverse as beading spindles and hollowing end-grain vessels. Here's how to use them, along with pointers about using parting tools.

Get into a few good scrapes

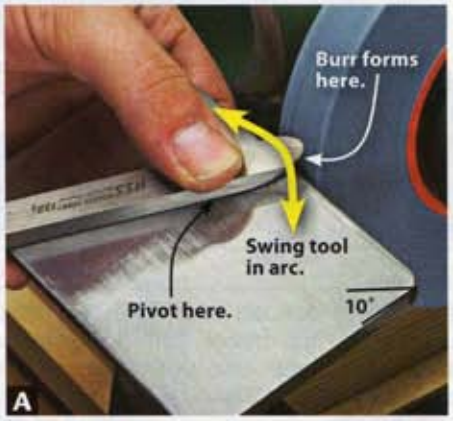
Unlike with a gouge or a skew, the bevel on a scraper doesn't lay against the workpiece to support the wood fibers as they are cut. So tear-out is more likely when turning spindles with a scraper.

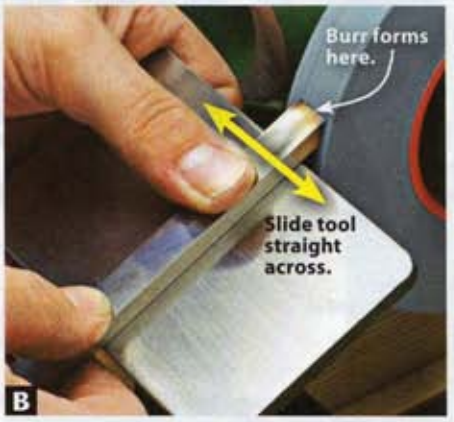
Despite this, a scraper offers an advantage for turning spindles: The blade end can be formed to any shape, and will produce the exact pattern repeatedly, as in the case of beading scrapers, shown *right*. And a round-nose scraper is an effective, easy-to-use tool for hollowing end-grain turnings.

For best results, start with a sharp scraper

Sharpen square- or round-nose scrapers on a bench grinder. Position the tool rest 10° from horizontal to grind an 80° bevel on the blade. Lightly touch the tool to the wheel, and then swing a round-nose tool [**Photo A**], or slide a square-edge one [**Photo B**], against the wheel, maintaining the end contour. Some turners burnish the resulting burr with a special device for a smoother cut.

To sharpen a beading scraper, hone flat across the top on a bench stone [**Photo C**]. Although scrapers cut better when sharpened on a grinding wheel, grinding the bevel could distort the contour.

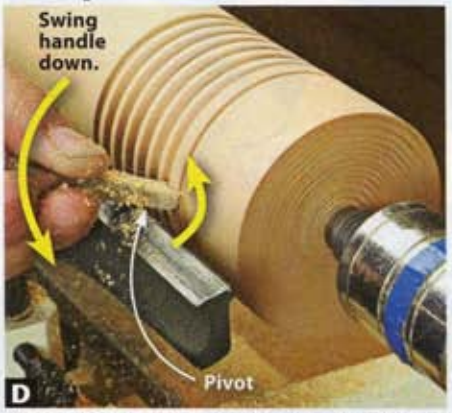


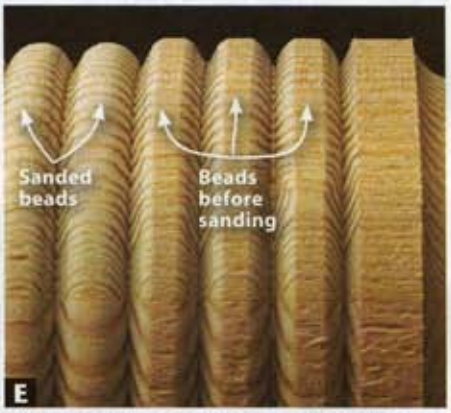


Take a turn on a spindle with a scraper

Start by positioning the tool rest parallel to the lathe axis, slightly above the centerline. Lay the scraper blade flat on the tool rest, perpendicular to the axis of the workpiece. Raise the handle higher than the tip so the tip contacts the workpiece below the centerline [**Photo D**]. Then lower the handle in a smooth motion, raising the tip to make a shallow cut. Do not, however, let the handle go lower than the tip. Repeat until you reach the desired profile on the spindle.

When using a beading scraper, turn the blank (or the area on it that will be beaded) to the diameter of the top of the beads. As you form the beads, leave a small flat at the top center to be sanded away later [**Photo E**]. Cutting to full depth with a beading scraper almost always causes significant tear-out.





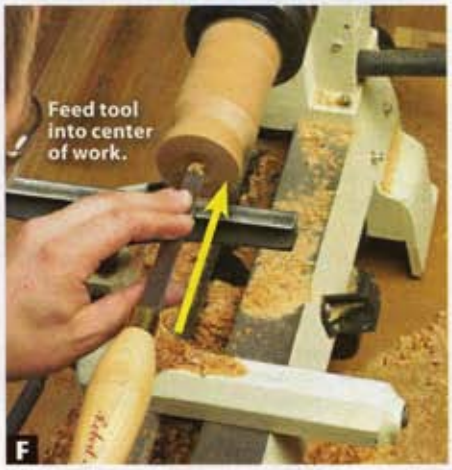
Scrape out end grain to make hollow vessels the easy way

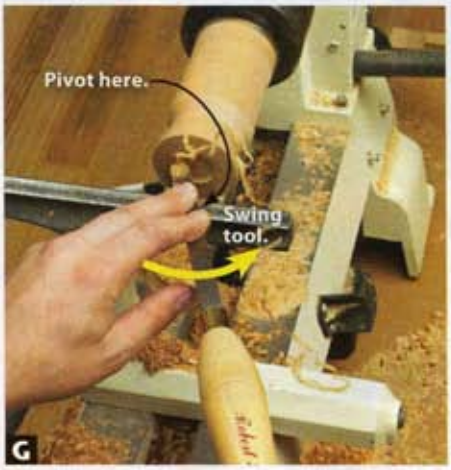
It's hard to beat a ½" round-nose scraper for hollowing endgrain vessels such as weed pots or goblets. The scraper is both effective and easy to control.

Chuck the workpiece and position the tool rest across the end of the piece, slightly above center. With the scraper flat on the tool rest, raise the handle enough to bring the tool tip to the centerline on the workpiece [**Photo F**]. Push the tool into the center of the revolving workpiece, and then swing the handle toward the back of the lathe [**Photo G**].

Keep the handle of the tool raised so the tip stays on the centerline. Repeat cutting from the center toward the rim until you reach the desired shape and depth. Adjust the cavity shape by sliding the tool on the rest and varying the rate at which you swing the handle.

To reduce tear-out by tilting the tool at a 45° angle on the tool rest while you swing the handle [**Photo H**]. Cutting at this angle is called "shear scraping."

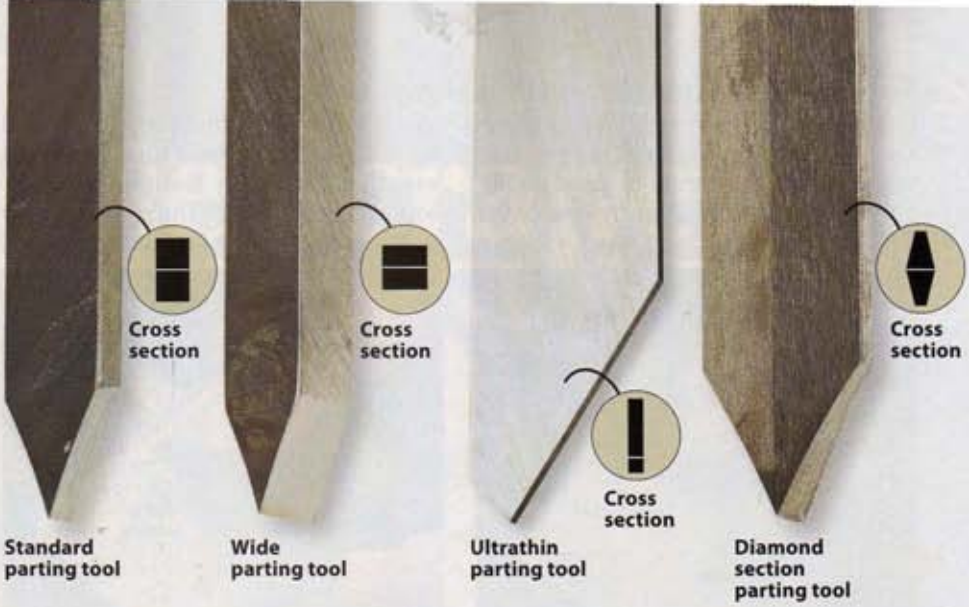




You'll like this part

Grab a parting tool to form tenons or grooves, cut in to specific diameters for reference points, or, of course, separate (or part) a turning into multiple pieces. Restrict the parting tool to work where the grain runs parallel to the lathe axis.

Parting tools come with either flat or diamond-section blades, shown *right*. A standard ⅛"-wide flat-blade parting tool fills the bill for most turners. Wider (¼" or ⅜") flat-blade tools excel at tenons, but prove more difficult to control in deep cuts. A knifelike 1/16" ultrathin flat blade minimizes grain interruption for jobs such as parting off a box lid. A diamond-section blade (typically 3/16" wide at the point) binds less in deep cuts.



Make it a point to part well

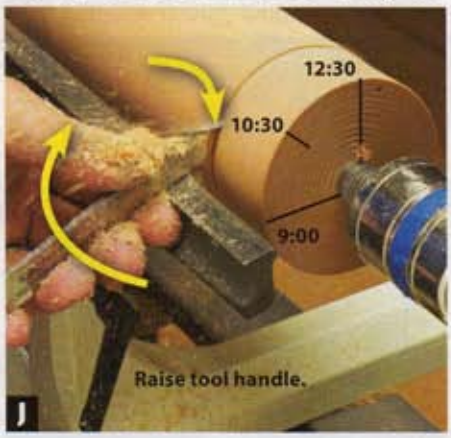
Sharpen a parting tool to a 45–80° total bevel angle at the tip [**Photo I**]. The exact angle isn't critical: A smaller angle cuts more aggressively, but a larger angle stays sharp longer. Experiment to find an angle that works best for you.

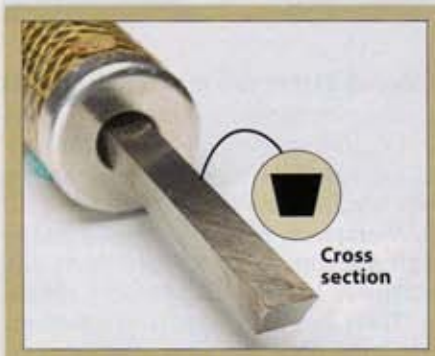
To sharpen the tool, adjust the grinder rest so the bevel rests on the wheel, stand the blade on edge on the rest, and slide it side to side. Flip the tool over and sharpen the opposite bevel until the bevels meet to form a sharp edge straight across the end. On a diamond-section tool, the bevels must meet at the widest part of the blade.

Here's the important part

With any parting tool, start by placing the tool rest parallel to the workpiece and slightly below its centerline. Stand the tool on edge on the tool rest, with its blade at a 90° angle to the workpiece. Touch the tip of the tool to the workpiece at the 10:30 position (when viewed from the tailstock) [**Photo J**]. Raise the handle, pivoting the tool on the rest, so the tip of the tool moves along the 10:30-to-center arc [**Photo K**]. Pull the tool straight back to remove it.

Continue this way until you reach the desired depth. You may have to widen the kerf to reduce friction in deep cuts. To do that, place the tool one-half its width to the waste side of your initial cut, then follow the 10:30-to-center arc as before. Alternate cuts on the left and right until you reach the desired depth.





The bedazzling bedan: It scrapes! It parts!

The French bedan can perform in much the same way as a skew. (See *WOOD*® magazine, May 2008, pages 70–73). "But I often use a ⅜" bedan as both a parting tool and a square-nose scraper," says woodturning expert Brian Simmons.

"By maintaining a 60–70° bevel, I can use it like a parting tool to produce ⅜"-wide parts and tenons—it makes long tenons really quickly—and as a square-nose scraper to cut recesses to hold bowls in a chuck," Brian says.

The trapezoidal blade section reduces friction in parting cuts, and provides clearance at the bottom left corner when scraping recesses. It's less likely to catch on the work than a ½" square-nose scraper and, because it's ⅛" thicker than most scrapers, reduces vibration.

But don't try to replace your parting tools with a bedan, Brian warns. "When making lidded boxes, for instance, a narrower part minimizes waste, and the grain lines up better," he says.

Written by **Larry Johnston** with **Brian Simmons**

Better Homes and Gardens®

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March 2009 *Issue 189*

Dear Reader: As a service to you, we've included full-size patterns on this insert for irregular shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you're building.

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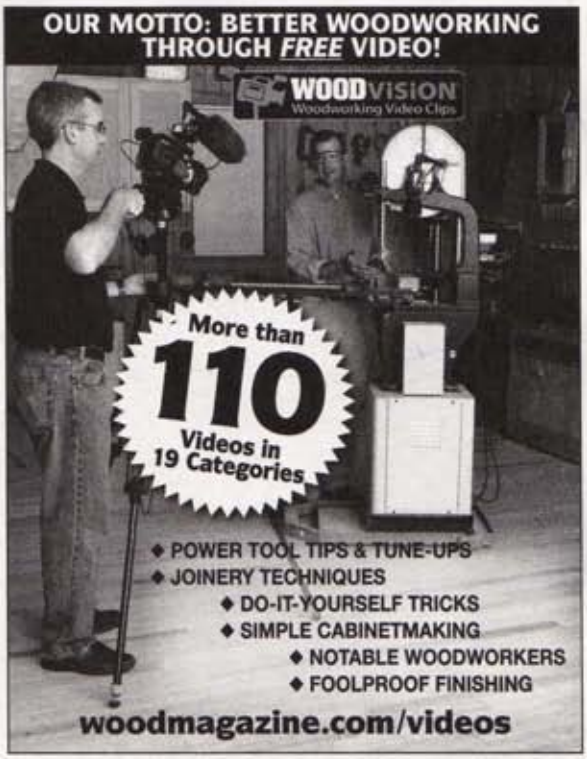
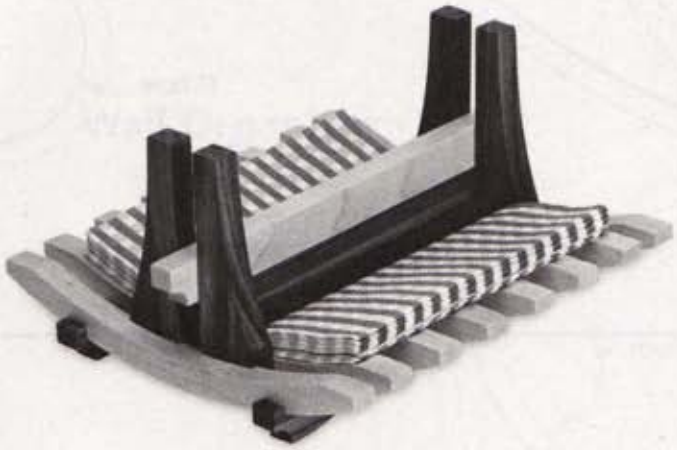
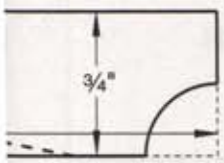
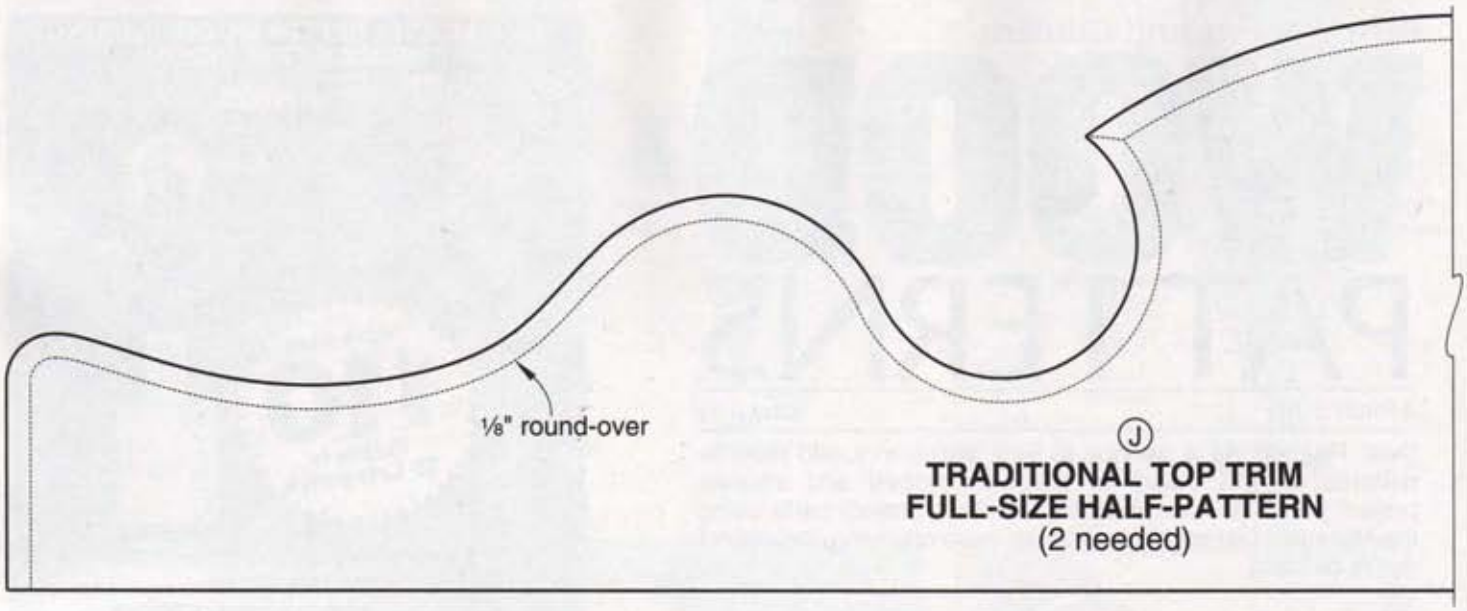




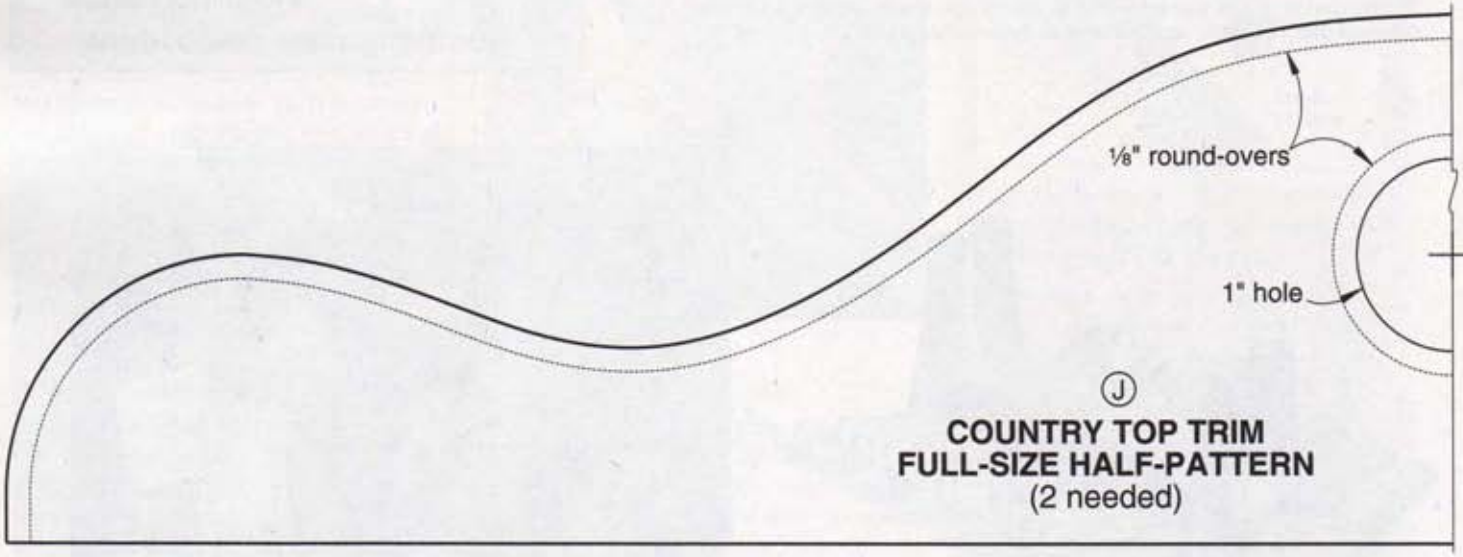
Nifty Napkin Holder
Page 20

Wall Organizer
Page 49

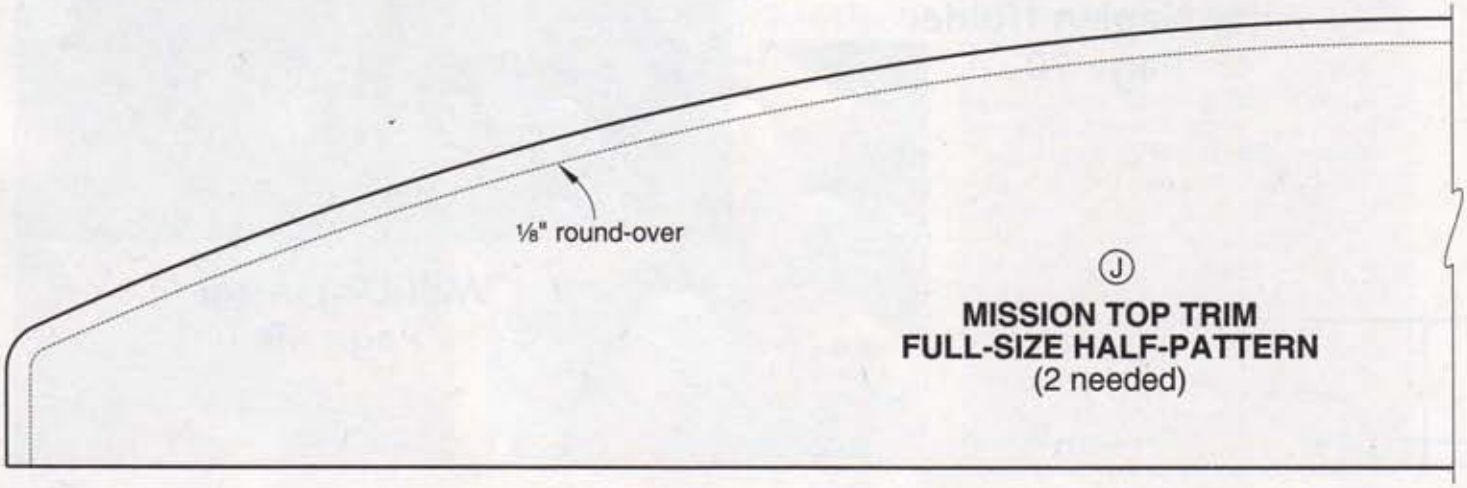




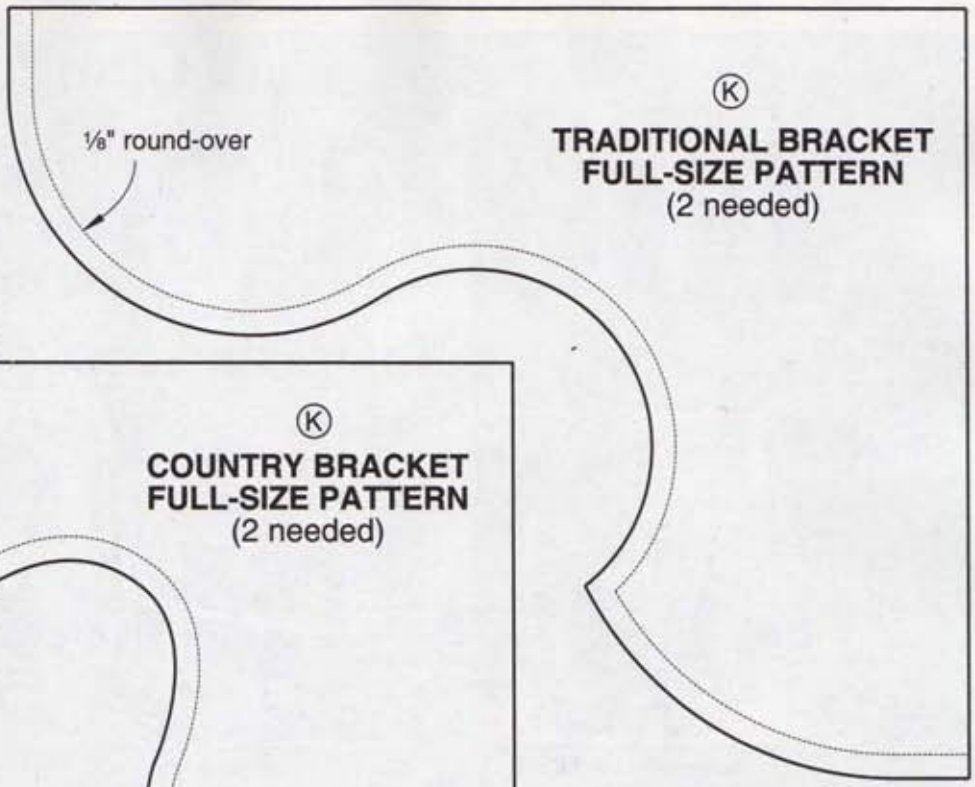
Ⓙ
TRADITIONAL TOP TRIM
FULL-SIZE HALF-PATTERN
(2 needed)

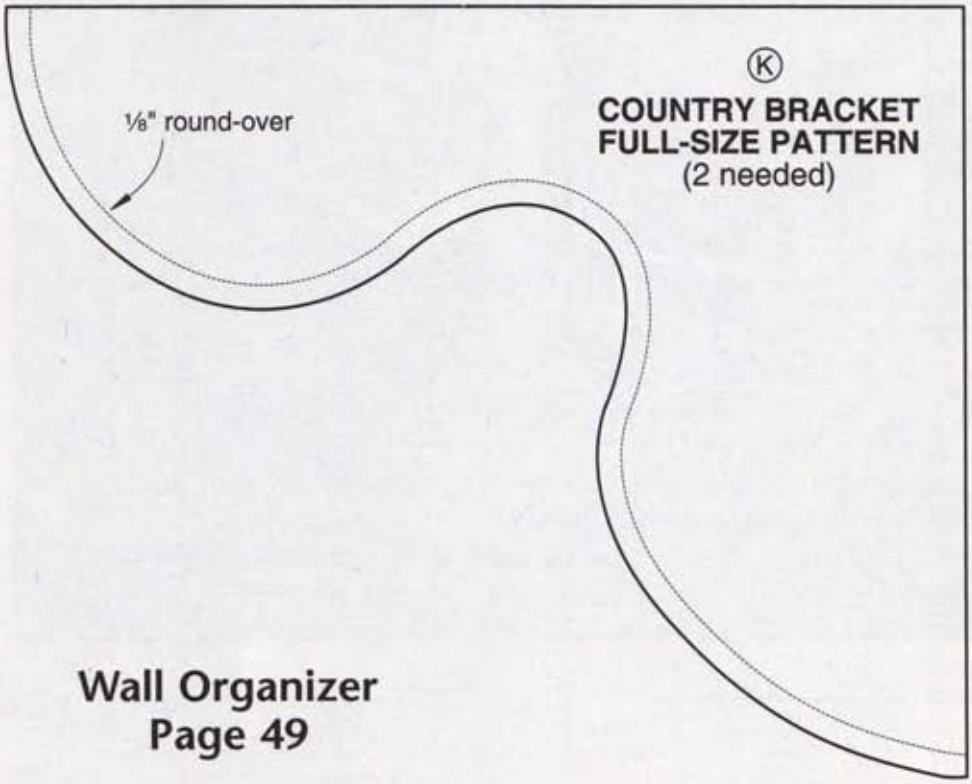


Ⓙ
COUNTRY TOP TRIM
FULL-SIZE HALF-PATTERN
(2 needed)

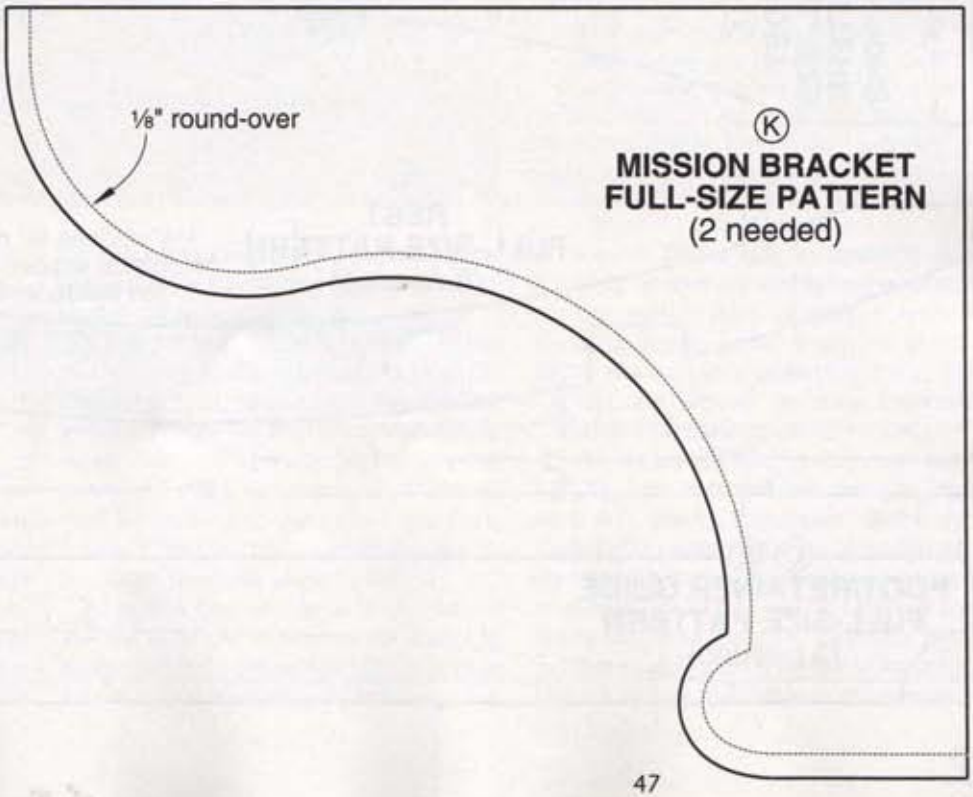


Ⓙ
MISSION TOP TRIM
FULL-SIZE HALF-PATTERN
(2 needed)





Wall Organizer
Page 49



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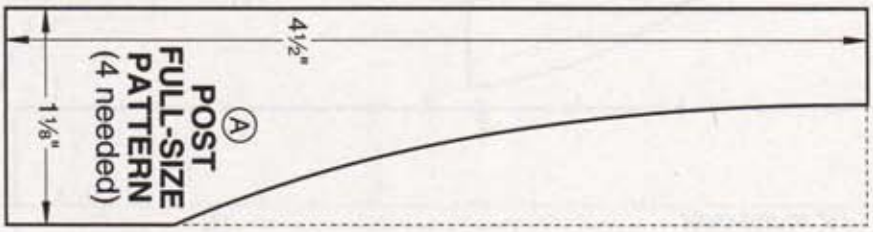
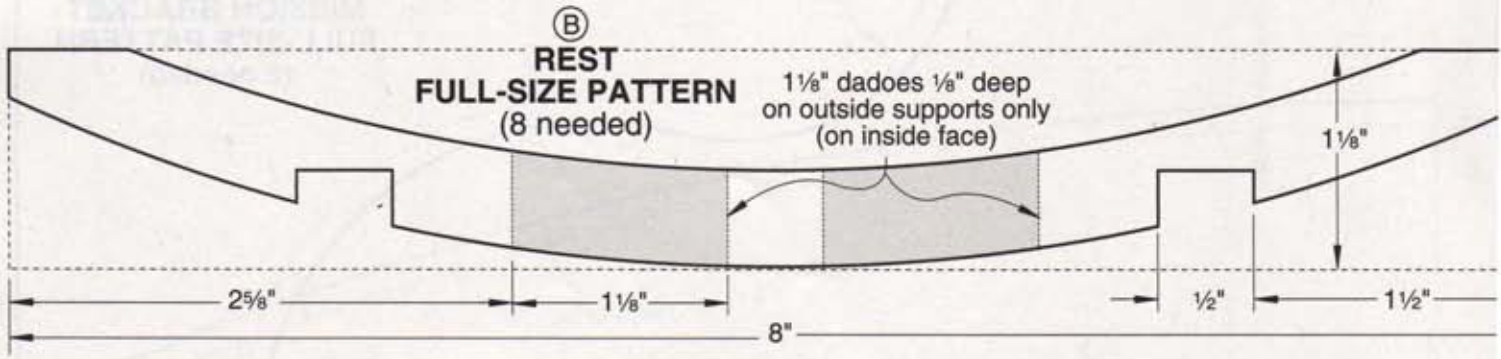
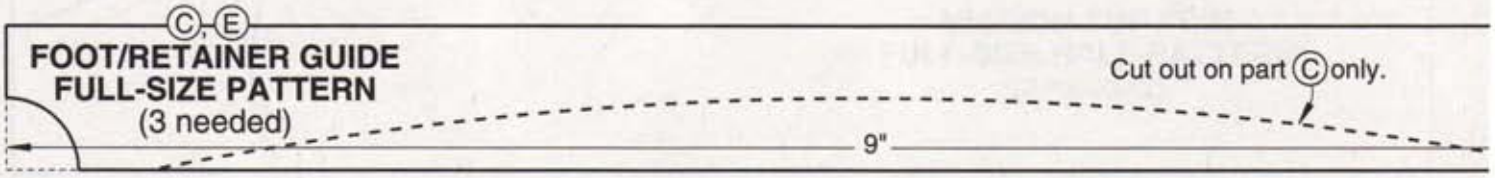


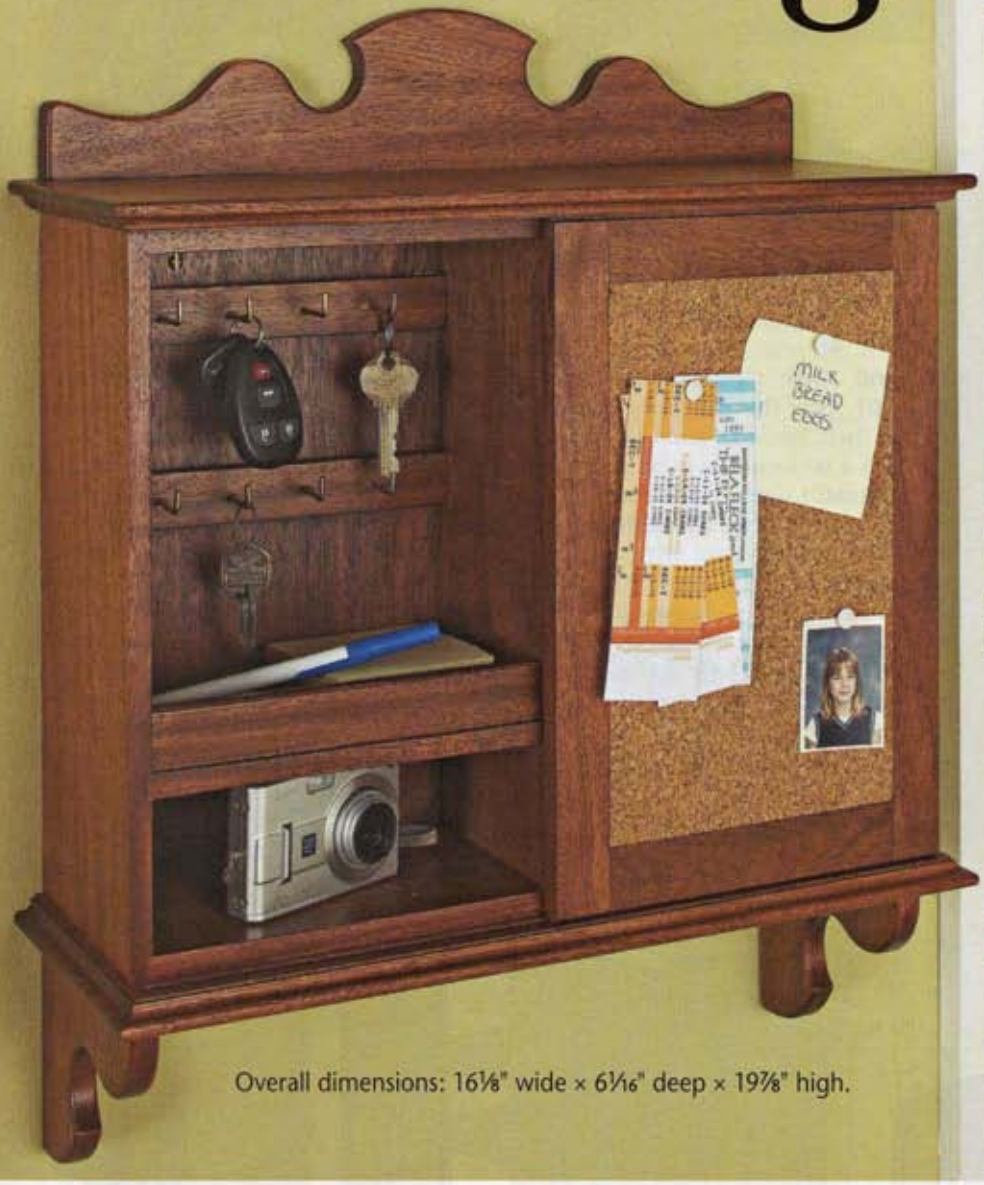
Nifty Napkin Holder
Page 20





Sliding-door Hideaway

Wall Organizer



Overall dimensions: 16⅛" wide × 6⅛16" deep × 19⅞" high.

Keep your keys, cell phone, and other necessities where you can find them in a hurry.

AT A GLANCE

■ Materials needed: ½" and ⅜" mahogany, ¼" mahogany plywood. For the country version (see *page 52*), you could substitute pine; quartersawn white oak or cherry would be appropriate for building the traditional-style organizer (*page 52*).

Plenty of storage behind a sliding bulletin-board door makes this wall-hung organizer practical, while three optional trim styles ensure it will look great in any home. Straightforward construction seals the deal.

Construct the case first

1 Cut the sides (A), case top/bottom (B), and back (C) to size [**Materials List**, *page 53*]. Cut blanks for the divider (D), shelves (E), shelf trim (F), hook rails (G), and back support (H) about ½" longer than shown. If you can't readily buy ⅜" and ½" stock, resaw and plane thicker material. (You can buy an article with detailed resawing instructions, including plans for a resawing jig, by going to woodmagazine.com/resaw.)

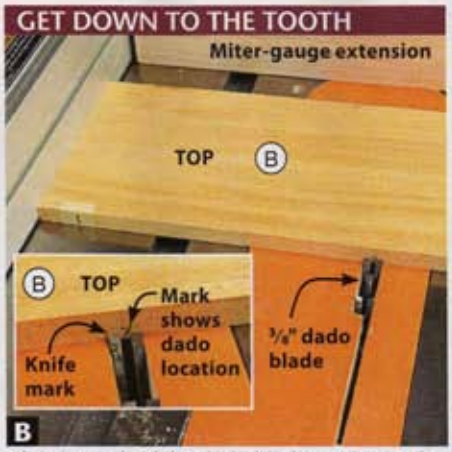
2 Cut the groove for the back (C) in the sides (A) and case top and bottom (B) [**Drawings 1, 2**]. ***Quick tip! Match the groove width to the plywood thickness.*** Your ¼" plywood may not be exactly ¼" thick, so measure its thickness first, and then cut the groove the same width. Place the front edge of the groove 4½" from the front of each part.

3 Lay out the rabbets at both ends of the sides (A) to receive the case top and bottom (B) [**Drawings 1, 2**]. Mark the rabbet width accurately by holding a top or bottom and a side in position and marking against the inside face of part B on the mating face of part A with a marking knife, crafts knife, or utility knife. Mark all four rabbets.

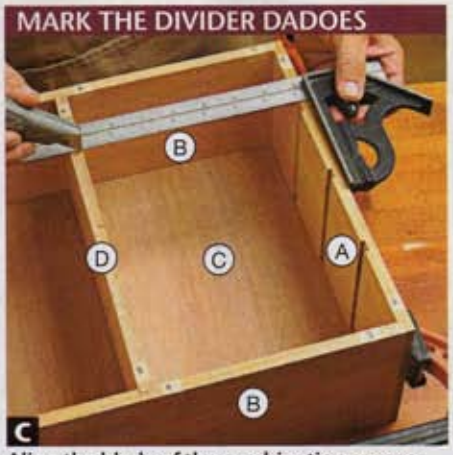
4 Cut the rabbets on your tablesaw with a ⅜" dado blade.

5 Dry-assemble and clamp the sides (A), case top and bottom (B), and back (C). Check for square. ***Quick tip! Label the corners for easy, accurate assembly.*** Stick strips of masking tape near the corners on the front edge of the sides, top, and bottom. Number both parts at each corner with the same number. For fitting and final assembly, match

Align the knife point with the measurement on the steel rule, and then press the blade into the wood for a spot-on mark.



Align a tooth of the dado blade on the mark (inset), keeping the cut on the correct side. A miter-gauge extension reduces splintering.



Align the blade of the combination square with the top of each dado in the sides (A), and mark the locations on the divider (D).

the numbers at each corner to keep the parts in the same relation.

6 Lay out the dadoes at the middle of the case top and bottom (B) [**Drawing 1**, **Photo A**]. You can mark just one side of the dado, but draw an X at the dado location to ensure that you make the cut on the correct side of the mark.

7 Unclamp the assembly. Then cut the dadoes in the case top and bottom (B) [**Photo B**].

Add the divider and shelves

1 Dry-assemble and clamp the sides (A), case top and bottom (B), and back (C). Check for square.

2 Cut the divider (D) to fit snugly in the case top and bottom (B) dadoes. The **Skill Builder**, *opposite*, explains a method for accurately determining the length of the divider. Number the joints, as you did the corners.

3 Disassemble the case. Then lay out and cut the dadoes on the sides (A), three on the right side and one on the left side [**Drawings 1, 2**].

4 Dry-assemble the case (A–D). Check for square. Then, transfer the dado locations from the sides to the divider, using a combination square and marking knife [**Photo C**]. Disassemble the case. Cut the dadoes in the divider (D) [**Drawing 3**].

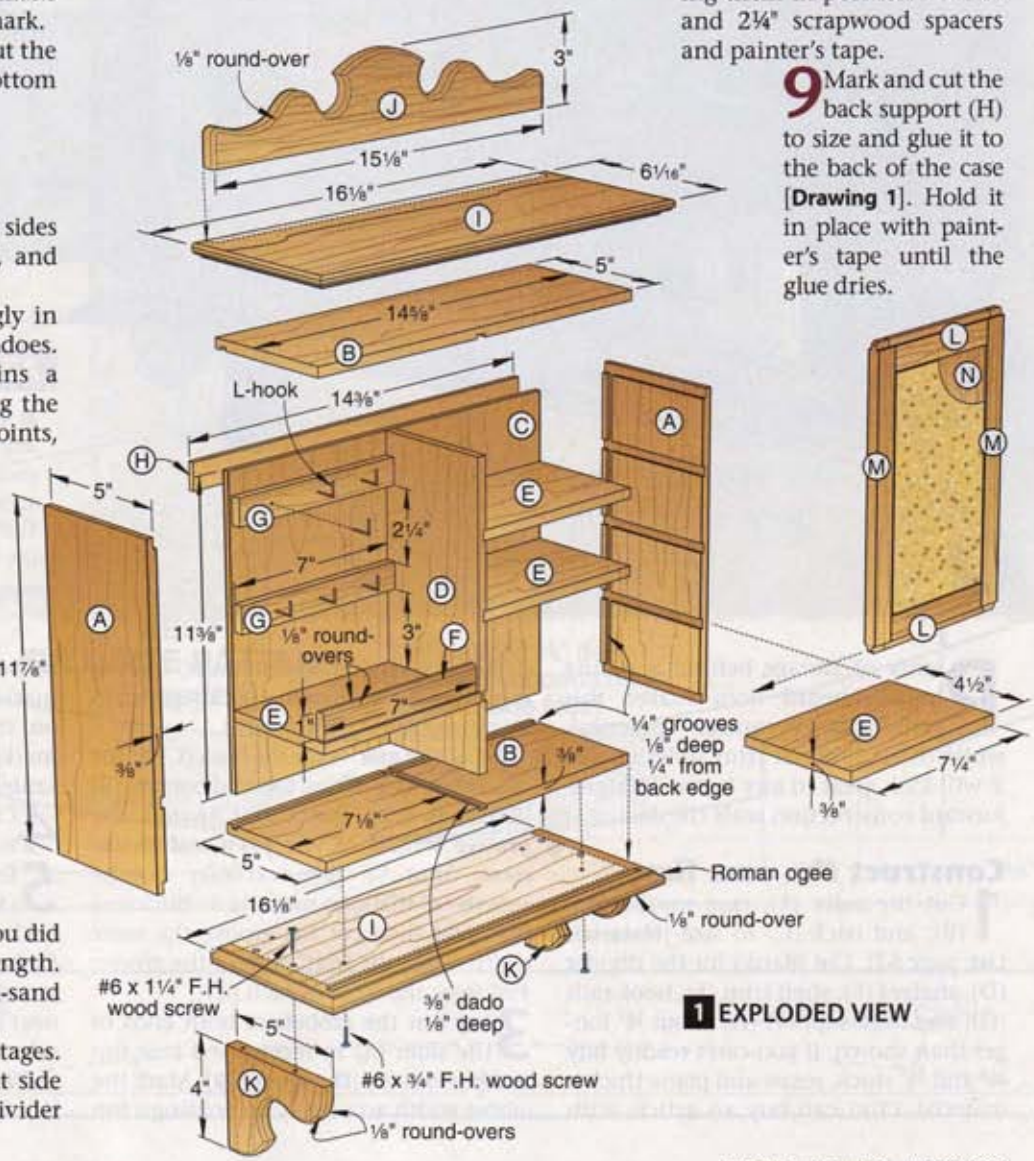
5 Dry-assemble and clamp the case (A–D). Check for square. Fit the four shelves (E) as you did the divider, and cut them to length. Disassemble the case and finish-sand parts A–E to 220 grit.

6 Glue the case together in two stages. First, glue and clamp the right side (A), case bottom (B), back (C), divider (D), and three right-side shelves (E) [**Photo D**]. After that assembly dries, add the left shelf, left side, and case top.

7 With a ⅛" round-over bit in a table-mounted router, round over the top edges of the blank for the shelf trim (F). Mark and cut to length and sand it to 220 grit. Glue and clamp it to the shelf (E), ⅛" from the edge [**Drawing 1**].

8 Mark and cut the hook rails (G) to length, and finish-sand them. Glue them to the back (C) [**Drawing 1**], holding them in position with 3" and 2¼" scrapwood spacers and painter's tape.

9 Mark and cut the back support (H) to size and glue it to the back of the case [**Drawing 1**]. Hold it in place with painter's tape until the glue dries.



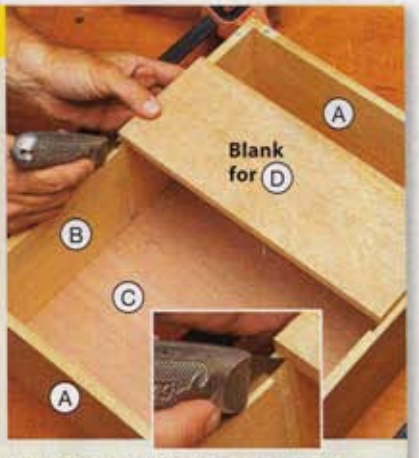
1 EXPLODED VIEW

SKILL BUILDER

When precision matters, mark instead of measuring

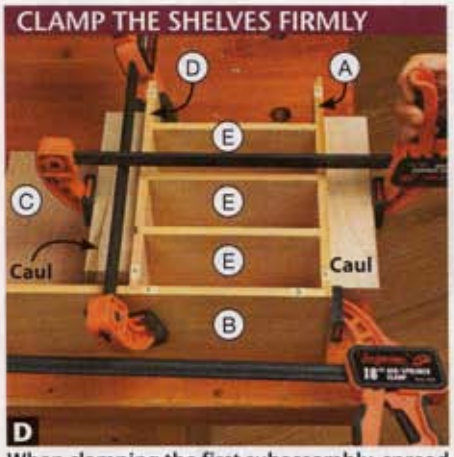
Cutting a part to size by measuring and marking can achieve a tolerance of 1/16", or, perhaps, 1/32". But even a 1/32" gap could be glaringly evident on a project the size of this wall organizer.

To make sure parts like the divider (D) and shelves (E) fit precisely, lay down your tape measure and pencil and pick up a marking knife, crafts knife, or utility knife with a fresh, sharp blade.



To fit the divider, for example, lay the divider blank on the front edge of the dry-assembled case, aligning one end of the blank with the bottom of the lower dado, as shown. Then, with the knife, mark the other end of the blank at the bottom of the upper dado (*inset*).

Align the mark with a tooth on the saw blade, as you did for cutting the dadoes, to cut the part to exact length.



When clamping the first subassembly, spread the clamp pressure across the three right-side shelves (E) with scrapwood cauls.

Put on the top and bottom

1 Cut the top and bottom (I) and the blanks for the top trim (J) and brackets (K) to size.

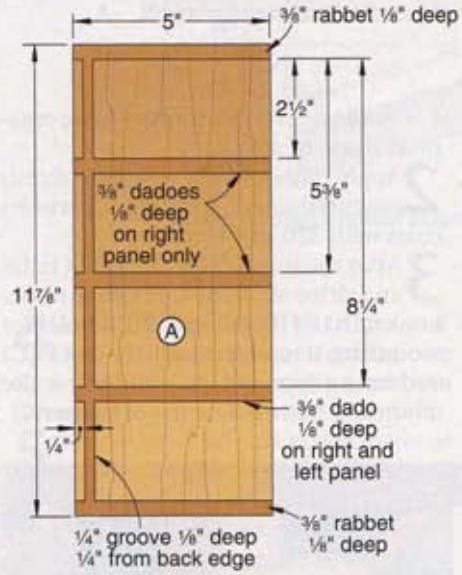
2 Set up your table-mounted router, as shown in Step 1 of **Drawing 4,** to form the sliding-door grooves in the top and bottom [**Drawings 1, 5**]. Mark stop lines on the fence 5/8" on each side of the bit centerline [**Photo E**].

3 To rout the groove, place the front edge of the bottom (I) against the router-table fence, with the left end raised above the bit and on the mark at the left of the bit [**Photo E**]. With the router running, lower the part onto the bit and feed it toward the left until the right end meets the mark at the right of the bit. Then, stop and lift the part straight up. Repeat for the top. Square the ends of the grooves with a chisel.

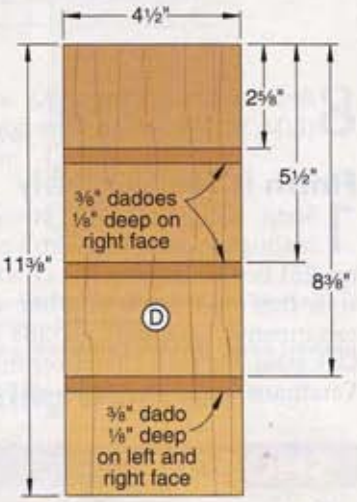
4 Set up the table-mounted router with a Classic Roman ogee bit, as shown in Step 2 of **Drawing 4**. Rout the profile along the front edge and ends on the grooved side of the top and bottom (I).

5 Change to a 1/8" round-over bit, as shown in Step 3 of **Drawing 4**. Rout the front edge and ends on the ungrooved side of the top and bottom (I). Keep the set up. Finish-sand the top and bottom.

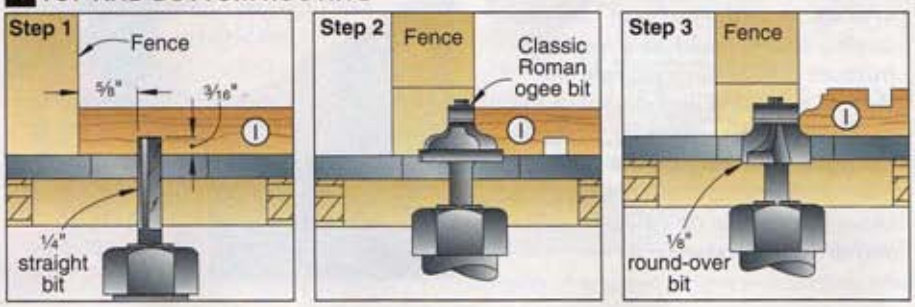
2 SIDE (Inside face of right panel shown)



3 DIVIDER (Right face shown)



4 TOP AND BOTTOM ROUTING



Give the case some style

1 Make two copies of the top trim half-pattern and bracket patterns you want to use (**Designer's Notebook**, *page 52.*) Cut them out with a knife or scissors and adhere them to the blanks for the top trim (J) and brackets (K) with spray adhesive.

2 Bandsaw the top trim (J) and brackets (K) [**Photo F**]. Saw slightly outside the pattern lines and sand to the line. Rout a 1/8" round-over along the edges indicated on the patterns. Finish-sand the top trim and brackets.

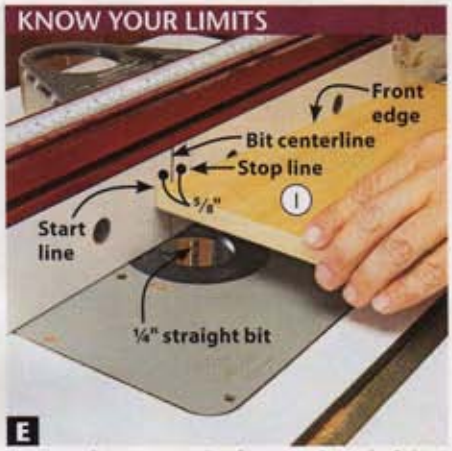
3 Glue and clamp the top trim (J) centered on the top (I) [**Drawings 1, 5**].

4 Glue and screw the bottom brackets (K) to the bottom (I) [**Drawings 1, 5**]. (We added screws to the bottom brackets because they are glued on the end grain. See the **Shop Tip**, *page 52*. For #6 screws, drill 3/32" pilot holes, 5/64" in pine.)

5 Glue and clamp the top (I/J) to the top of the case (A–H), flush at the back and centered side-to-side [**Drawing 1**].

Slide over to the door

1 Cut the door rails (L), stiles (M), and panel (N) to size.



E

To stop the grooves ½" from each end of the top and bottom (I), mark the fence ⅝" from the bit centerline on each side.

2 Center a ¼"-deep groove the same width as the thickness of the panel (N) on one edge of each rail (L) and stile (M) [**Drawings 6, 6a**].

3 Rabbet the ends of the rails (L) to form stub tenons that fit into the grooves in the stiles (M) [**Photo G, Drawings 6, 6a**]. ***Quick tip! Adjust rabbet depth to make the tenon fit.*** If the grooves in your rails (L) and stiles (M) are narrower than ¼" because your plywood panel (N) is thinner than ¼", the ⅛" rabbet depth shown will result in a tenon too thick to fit into the groove. Raise the blade slightly and recut the rabbets to fit the tenons to the grooves.

4 Glue and clamp the rails (L), stiles (M), and panel (N) [**Drawing 6**]. Check the door for square.

5 To fit the door (L/M/N), measure the assembled door and cut a piece of ½" MDF or plywood the same size to use as a test panel. Cut ¼" rabbets ⅛" deep on both sides at both ends of the test panel. Fit one end of the test panel into the door groove in the top (I), and then clamp the bottom (I/K) to the case assembly (A–J), trapping the panel in the top and bottom grooves [**Photo H**]. The test panel should slide smoothly and have an equal reveal at the top and bottom, about 1/16". If not, adjust the rabbets as necessary.

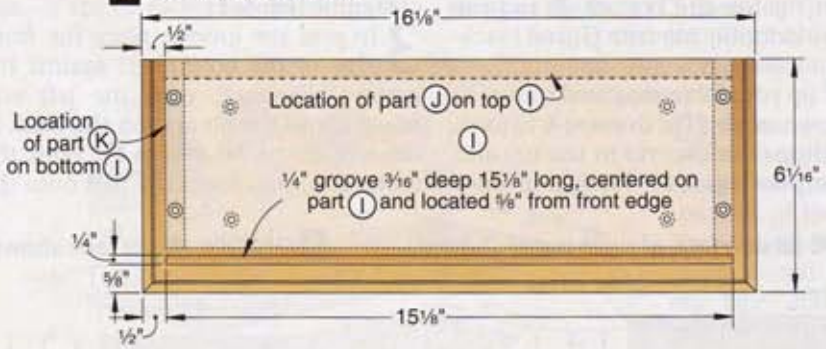
6 Cut rabbets on the door (L/M/N), matching those on your test panel. Sand chamfers on the sliding tenons [**Drawing 6**]. Temporarily install the door as you did the test panel and test it.

7 Attach the bottom (I/K) to the case (A–J), trapping the door in the grooves. Screw, but do not glue, the bottom in place [**Drawing 1**]. When you drill pilot holes, put a stop collar or piece of masking tape on your drill bit to mark the depth so you won't drill through.

DESIGNER'S NOTEBOOK

By selecting different trim or material options you can build your cabinet to match any of three styles. The opening photo on *page 49* shows the classic version in mahogany. You can also choose traditional (*above left*) or country style (*above right*). See finishing options for the different versions *below.*

5 TOP AND BOTTOM



8 Remove the bottom (I/K) and door (L/M/N). Finish-sand the door.

Finish it for assembly

1 Stain all parts. (We stained the mahogany organizer with Varathane no. 251 Red Mahogany. For a traditional-style organizer made of white oak, we recommend Varathane no. 263 Mission Oak stain. Or, for a cherry organizer, try Varathane no. 245 Traditional Cherry. We would not stain a country-style organizer made of pine.)

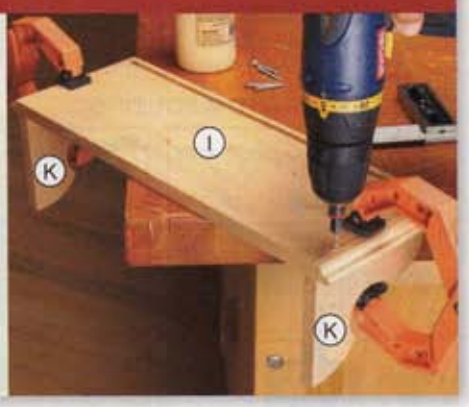
2 Apply three coats of satin-finish polyurethane, sanding between coats with 320-grit abrasive.

3 After the finish dries, drill pilot holes and drive six brass L-hooks into the hook rails (G) [**Drawing 1**]. Drill holes for mounting screws through the back (C) and back support (H). Countersink the mounting holes inside the organizer.

SHOP TIP

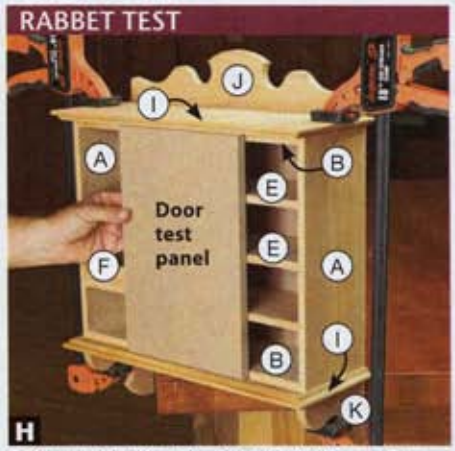
Drive screws after the glue dries

Trying to hold a just-glued bracket (K) in place while drilling pilot holes and driving screws could be a mightily frustrating task. Save yourself the trouble by gluing and clamping the brackets to the bottom (I), and then letting the glue dry before drilling the holes and driving the screws (*right*). Leave the clamps on while you drill and drive the screws.

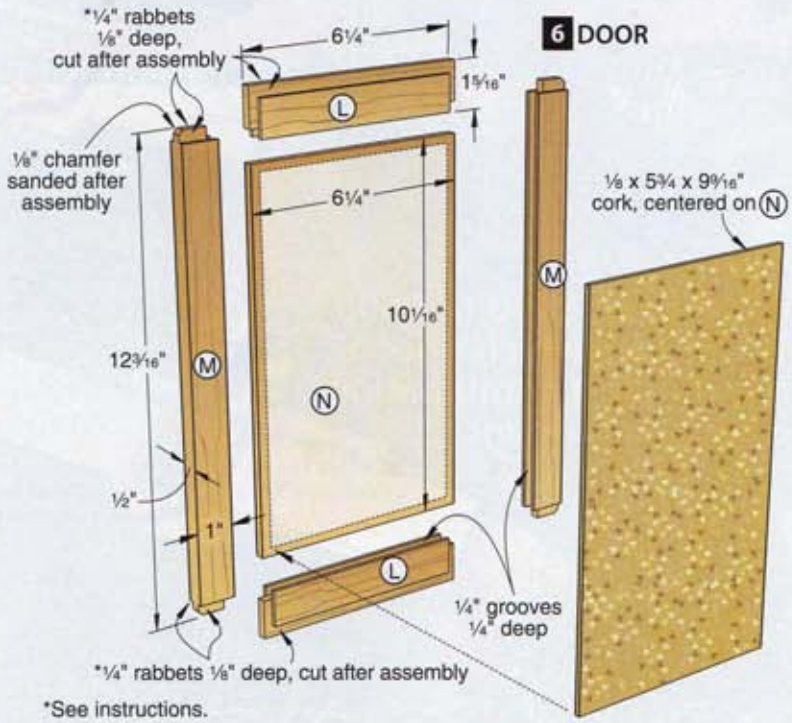


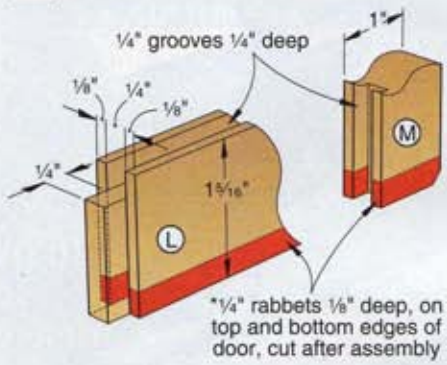
Cut away the large waste, and then make relief cuts into tight curves to bandsaw the top trim and brackets more easily.

Set the tablesaw fence as a stop for the tenon length and use a miter-gauge extension to minminimize tear-out on the door rails (L).



Before rabbeting the door (L/M/N), make a test panel to ensure the tenons will fit the grooves correctly.





Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A	sides	⅜"	5"	11⅞"	M	2
B	case top/bottom	⅜"	5"	14⅝"	M	2
C	back	¼"	14⅝"	11⅜"	MP	1
D*	divider	⅜"	4½"	11⅜"	M	1
E*	shelves	⅜"	4½"	7 ¼"	M	4
F*	shelf trim	⅜"	1"	7"	M	2
G*	hook rails	⅜"	1"	7"	M	2
H*	back support	¼"	1"	14⅜"	M	1
I	top/bottom	½"	6¹⁄₁₆"	16⅛"	M	2
J	top trim	½"	3"	15⅛"	M	1
K	brackets	½"	5"	4"	M	2
L	door rails	½"	1⁵⁄₁₆"	6¼"	M	2
M	door stiles	½"	1"	12³⁄₁₆"	M	2
N	door panel	¼"	6¼"	10¹⁄₁₆"	MP	1

*Parts initially cut oversize. See instructions.

Materials key: M–mahogany, MP–mahogany or lauan plywood.
Supplies: Spray adhesive, #6x¾" and 1¼" flathead wood screws, size 112 brass L-hooks (6).
Blade and bits: Dado set, ⅛" round-over, ¼" straight, and Freud 38-402 Classic Roman ogee router bits.

Source

Cork: Adhesive-backed cork gasket, ⅛x12x36" sheet, part no. 9487K53, $7.21 plus shipping. McMaster-Carr, 630-600-3600 or mcmaster.com.

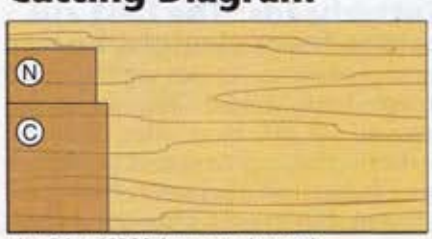
4 Screw the bottom (I/K) to the case (A–J) (without glue), trapping the door (L/M/N) in the sliding grooves [**Drawing 1**].

5 Cut a piece of ⅛" cork gasket material to fit the recess on the door and attach it to the door [**Drawing 6**]. (We used cork with an adhesive backing.)

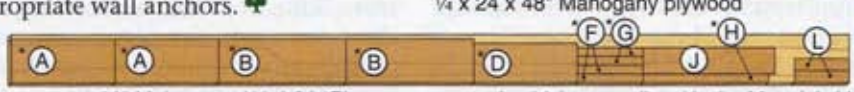
6 Hang the organizer in the entry hall or near the door you use most often with screws driven through the back (C) and back support (H) into wall studs or appropriate wall anchors.

Written by **Larry Johnston** with **Jeff Mertz**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

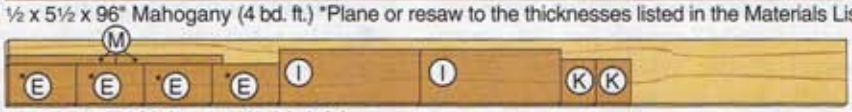
Cutting Diagram



¼ x 24 x 48" Mahogany plywood

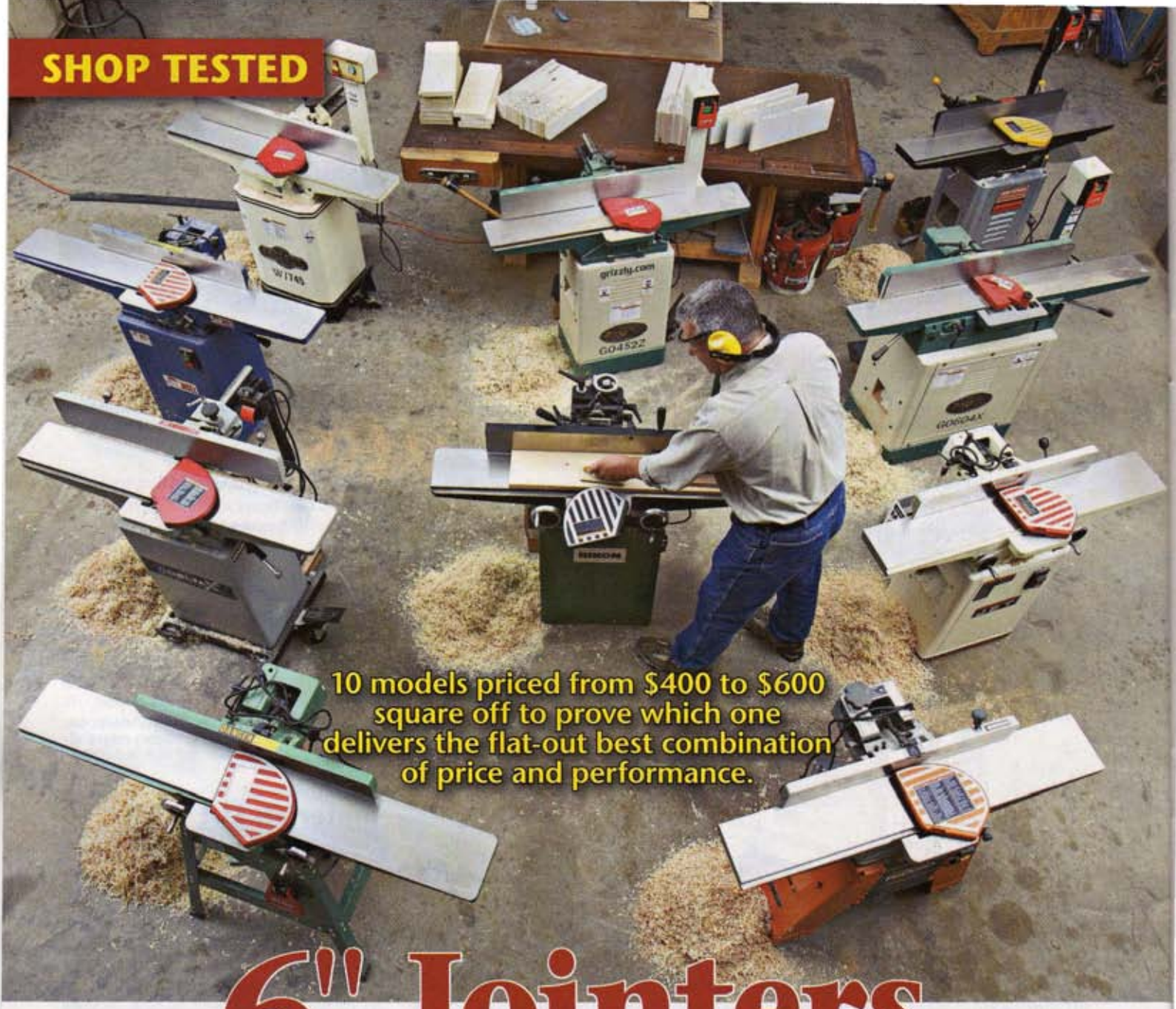


½ x 5½ x 96" Mahogany (4 bd. ft.) *Plane or resaw to the thicknesses listed in the Materials List.



½ x 7¼ x 96" Mahogany (5.3 bd. ft.)

SHOP TESTED



10 models priced from $400 to $600 square off to prove which one delivers the flat-out best combination of price and performance.

6" Jointers

Some woodworkers consider a jointer a luxury. Rather, we call any machine that flattens faces and squares the edges of rough, warped, or oversize lumber a godsend. Sure, you can buy larger—and more expensive—jointers, but a machine that face-joints 6"-wide stock will satisfy most of us. With user-friendly options galore in this class, from long tables to spiral cutterheads to built-in mobile bases to power switches mounted on pedestals, buying a jointer can be more rewarding—and confusing—than ever before. Read on as we test and sort out this popular category of jointers.

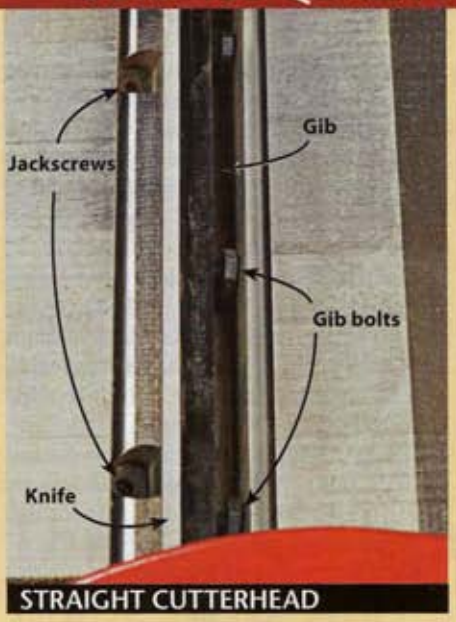
Cutterheads: The best cut comes from straight knives

In our testing, those jointers with straight-knife cutterheads, as shown *opposite, top left*, most often delivered perfectly flat, unblemished workpiece faces and edges. Granted, faster feed rates left scallop marks, but these virtually disappeared with slower feed speeds. Of all the tested machines, the General International 80-075L and Jet JJ-6CSX produced the best surfaces, with the Grizzly G0604X (which has four knives instead of the typical three), Ridgid JP0610, and Rikon 20-110 finishing slightly behind in this test.

Sunhill's SM-150 uses thin high-speed-steel knives that conform to grooves in a helical head, as shown *opposite, top right*. But these knives produce shallow grooves down the length of the workpiece rather than a consistently flat surface. And the carbide cutters on Grizzly's G0452Z created a similar pattern. Both of these surfaces required about twice as much planing, scraping, or sanding (compared to straight knives) to remove the linear striations.

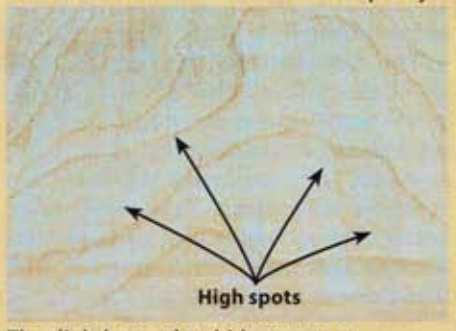
But the spiral carbide cutterhead blew away the field when we face-jointed bird's-eye maple. Although this highly figured wood proves difficult to dimen-

SURFACE QUALITY DEPENDS ON THE TYPE OF CUTTERHEAD

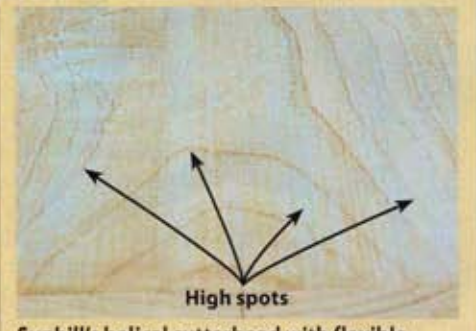


We rubbed the test sample boards with blue chalk to reveal the quality of cut from each cutterhead.

We got a smooth, consistent wood surface from the four straight knives on the Grizzly G0604X cutterhead.



The slightly arced carbide cutters on the Grizzly G0452Z leave linear grooves separated by high spots.



Sunhill's helical cutterhead with flexible knives produced broad grooves separated by high spots.

sion without tearing out the attractive grain and features, the carbide cutters of the Grizzly G0452Z sheared the wood cleanly for a stellar finished surface. The remaining jointers showed at least 1/32"-deep tear-out.

Cut quality aside, the Grizzly G0452Z and Sunhill feature the quickest knife changes in our test. With four cutting edges each, Grizzly's 32 square carbide cutters can be rotated 90° when they become dull. And if you get a nick in one spot, you need to rotate only the nicked cutters to regain a clean cut. The Sunhill single-edge disposable knives self-index with six bolts (similar to benchtop planers), so there's no fuss over setting them to the correct height.

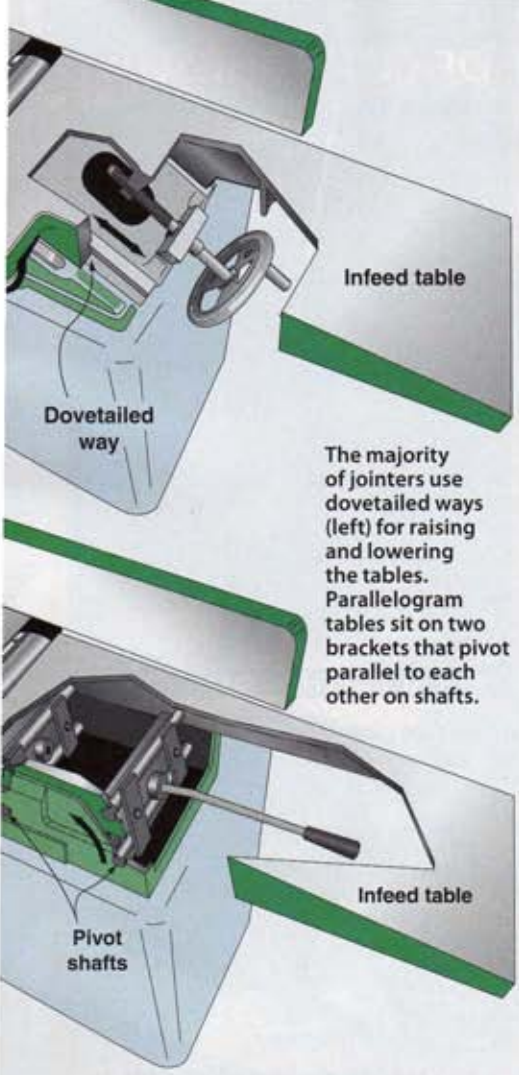
The remaining jointers use the traditional system of jackscrews to adjust the knife height and gibs with bolts to hold the knives in place on the cutterhead. Oddly, only three models come with the specialized knife-setting tool required to accurately set the knives at identical, parallel heights. Changing these knives can take nearly twice as long as the other two styles if all goes well.

To test the durability of the knives on each machine, we edge-jointed ¾"-thick, 2'-long medium-density fiberboard (MDF)—typically not a good idea because its high glue content quickly wears down cutting edges. After 30 to 40 passes, all of the high-speed-steel knives began to show wear. But Grizzly's carbide cutters showed no dulling even after 120 passes. Now multiply that by four edges per cutter, and you might go years before replacing the cutters in this machine.

Some cutterheads need more power than others

In the days when all jointers used straight-knife cutterheads, motor ratings proved a reliable measure of cutting power. No longer: You also have to factor in the cutterhead because spiral models with carbide cutters require greater oomph to power through cuts. (This happens because two to three cutters are always in contact with the wood; straight knives have intervals—albeit split-second ones—between knife cuts.) For example, four machines with 1-hp-rated motors (General International, Jet, Ridgid, and Sunhill) held their own against two of the leading machines with 1½-hp motors, and all six single-horse models topped Grizzly's 1½-hp G0452Z with the spiral carbide cutterhead.

For a practical test of each jointer's power, we made 1/16"-deep cuts in 6"-wide hard maple, measuring amp draw as the motors responded to the workload. Only the Grizzly G0452Z offered resistance that required a slower feed rate. Next, we made ⅛"-deep cuts, and all but three models handled the cut with little to no problem: We were able to bog down both the Delta 37-275X and Grizzly G0452Z, and the Shop Fox W1745 wanted to kick the workpiece from our hands rather than make the cut. Slowing the feed rate by about half solved these problems for the Delta and Shop



The majority of jointers use dovetailed ways (left) for raising and lowering the tables. Parallelogram tables sit on two brackets that pivot parallel to each other on shafts.

Fox, but the Grizzly continued to struggle with that deep cut.

Ultimately, it becomes a question of which matters most to you: cut quality or time. With a jointer you can compensate for a lack of power with shallow cuts and slower feed rates. But you can't compensate for average to poor cut quality; all you can do is smooth it afterward with other tools.

A flat bed and fence are crucial; a long bed is a plus

To create flat surfaces on hardwood and softwood, a jointer must have dead-flat tables that are parallel with the knives (front to back). We checked each model's infeed and outfeed tables (together they're called beds) with a straightedge and feeler gauges, and found all within .0025" of perfectly flat. So, no problems there.

Setting the height of these tables proves critical, especially on the outfeed end. For that reason, we prefer a handwheel on the outfeed table for its ability to make finer adjustments. An outfeed table set lower than the knives results in snipe, a scooped cut on the last inch or two of the workpiece. Levers and handwheels work equally as well on the infeed table, where adjustments determine the depth of cut.

The beds on all but the Grizzly G0604X glide up and down on dovetailed ways, shown at *top left*. The Grizzly features a parallelogram movement, shown at *left*. We like the parallelogram style for its smooth, fluid movement, but it typically adds cost or comes on jointers that have other features that also drive up the price.

If you work often with 6' or longer stock, and have room in your shop, buy a jointer with a long bed. This enables you to work more accurately and safely with longer boards. The beds on the General International, Grizzly G0604X, and Sunhill measure 56" long, besting the other models by 10". That allows you to easily work with boards 2' longer than you could with short-bed models.

Greater length also comes in handy with fences. The tested models measured between 29" and 35" long. The "worst" three fences measured about .006" out of flat (bowing away from the cutterhead), but again it was no problem. (A fence more than .010" out of flat would need to be machined, if possible, to straighten it.)

The fences on four jointers (Delta, Grizzly G0452Z, Rikon, and Shop Fox) glide effortlessly front to back thanks to rack-and-pinion gears, shown *below left*. The others require a little muscle to slide on a molded keyway, shown *below right*. All proved accurate, but rack-and-pinion makes adjustments easier. However, rack-and-pinion fences make the jointer 3–6" deeper to accommodate the gear.

Each fence tilts at least 45° both sides of perpendicular to the bed, with adjustable stops for 45°, 90°, and 135°. Only the Craftsman and Rikon proved difficult to set consistently at 45° and 135°. The Craftsman's stops had a sloppy fit, and with Rikon's rack-and-pinion crank it was easy to overtighten the fence against the stop because the mating angles don't match perfectly.

More features to help you decide on a jointer

■ **Power switch.** We like the pedestal-mounted switches on the Craftsman 21705, Delta, both Grizzly models, Rikon, and Shop Fox. They're easier to reach than those mounted at knee level on the cabinets. Bonus points go to the Craftsman, General International, and both Grizzly machines for their large paddle-style "off" switches.

■ **Safety guards.** All the machines have similar cutterhead guards except the Grizzly G0604X. This model's design slightly impedes face-jointing a 6"-wide

A TALE OF TWO FENCES: RACK-AND-PINION TYPES ADJUST WITH GREATER EASE

You turn a handwheel to move a rack-and-pinion fence. Rikon's model also has a rack-and-pinion adjustment for tilting the fence.

Jet's fence slides front to back manually, using a keyway slot to keep it aligned with the jointer bed.

board. However, this guard better engages thinner stock (shown at *right*), whereas the others allow ½"-thick boards to slide underneath.

■ **Mobility.** Because these machines weigh 200 lbs or more, built-in mobile bases on the Grizzly and Shop Fox models come in handy when you need to move them. Adding an aftermarket mobile base adds $50 or more to the price of other jointers.

THIN-STOCK USERS BEWARE OF SAFETY-GUARD GAPS

The Grizzly G0604X's guard (left) features a ¼" gap from the bed, while the other models have a gap just over ½".

The straight (and spiral) lowdown on 6" jointers

Craftsman 21705, $580

800-383-4814, craftsman.com

The infeed table features a lever adjustment and easy-to-read depth scale, but the outfeed table's handwheel showed ⅛ turn of backlash (play in the threads without table movement when changing directions), making precise adjustments difficult. The fence tilt adjustment also proved unreliable, and this jointer was the loudest of the test at 101 decibels. It took us nearly three hours to assemble, longest in the test. There's a built-in shelf to hold the push pads.

Delta 37-275X, $600

800-223-7278, deltaportercable.com

One of two models in the test with a perfectly flat fence and bed, its 46¼"-long bed is almost matched by its 35"-long rack-and-pinion fence. You must bypass the lever-operated infeed table's depth stop for cuts deeper than 1/32", and the depth scale proved difficult to use accurately. We stalled its cutterhead easily with a ⅛"-deep cut, and the cut quality lacks the crisp cleanness of the leaders.

General International 80-075L M1, $600

888-949-1161, general.ca

The legs on this model's open stand have enough angle to give it a solid feel, and it's still one of the quietest in the test. There's a lot to like about this jointer: one of the most powerful machines in the test; long tables; easy-to-adjust, front-mounted handwheels; exceptional cut quality; and a large "off" switch (although we'd prefer that it were mounted on a pedestal).

Grizzly G0604X, $575

800-523-4777, grizzly.com

This unit has nearly everything we like in a jointer: Long bed and fence, pedestal-mounted switch with large "off" paddle, easy-to-adjust parallelogram tables with locks on the front, and a built-in mobile base. Add to that plenty of power and a four-knife cutterhead that delivers a quality finish. Our only gripes are a cutterhead guard that pinches against boards on 6"-wide cuts, a depth scale with confusing increments (five marks between zero and ½" rather than four or eight), and a dust chute that clogs easily.

Grizzly G0452Z, $575

800-523-4777, grizzly.com

This is one of two models with a perfectly flat bed and fence. The spiral cutterhead proved both a blessing and a curse. Its durable carbide cutters performed exceptionally on figured wood, might last for years, and create small chips—even when face-jointing—which won't clog a dust chute. But its cutterhead bogs down easily in cuts 1/16" or deeper, and jointed surfaces require additional smoothing.

Jet JJ-6CSX, $600

800-274-6848, jettools.com

It took only 23 minutes to assemble this no-frills jointer. The cut quality was among the best, in spite of a slight power drop-off when making deep cuts. Its front-mounted handwheels showed no backlash and proved accurate and easy to use. We'd prefer a longer bed and a pedestal-mounted power switch.

Ridgid JP0610, $430

866-539-1710, ridgid.com

This model shows surprising power and produces good cuts that need little cleanup. The depth scale proves the easiest to read and use, but the tiny table locks on the rear of the machine are tough to use. The large rubber-coated knob on the fence makes lateral adjustments easy, but we banged our knuckles on it when edge-jointing stock.

You can't buy this jointer; it's a photo montage of our favorite components from various machines.

Rikon 20-110, $575

877-884-5167, rikontools.com

This model's power tops the test, and it has two speed settings. (We got cleaner cuts with the faster one.) We also like its turnbuckle-style belt tensioner above the other models for quick, easy adjustments. Front-mounted handwheels make table adjustments easy, and the pedestal power switch can be located on either end of the machine. The fence has rack-and-pinion adjustments for both lateral movement and tilting, but it's confusing and seems overengineered.

Shop Fox W1745, $530

800-840-8420, shopfox.biz

With a long, tall fence with two handles, pedestal-mounted power switch, smooth fence and table adjustments, and a built-in mobile base, you'd think this jointer has it all. But it lacks power, and we had to force the fence to its back-most position to get a full 6"-wide cut. Jointed surfaces also require more sanding than most others.

Sunhill SM-150, $550

800-929-4321, sunhillmachinery.com

In spite of a long bed, the fence is one of the shortest in both length and height. The SM-150 has ample power, and knife changes proved quick and easy, but those flexible knives produced linear grooves that would show under a finish if not sanded out. Its fence was the most out-of-flat, although still acceptable.

6" JOINTERS: WHEN

BRAND	MODEL	RATED HORSEPOWER	CUTTERHEAD			OVERALL DIMENSIONS HxLxD, INCHES
			DESIGN (1)	MAX. WIDTH OF CUT, INCHES	SPEED, RPM	
CRAFTSMAN	21705	1½	3	6⅛	4,800	52×46×22
DELTA	37-275X	1	3	6⅛	4,800	48×46¼×28
GENERAL INTERNATIONAL	80-075L	1	3	6	4,800	38×56×20
GRIZZLY	G0604X	1½	4	6	4,850	48×55½×22
	G0452Z	1½	C	6	4,800	48×46⅛×28
JET	JJ-6CSX	1	3	6⅛	4,800	36×45⅝×20
RIDGID	JP0610	1	3	6⅛	3,450	36×45¾×20
RIKON	20-110	1½	3	6	4,500 / 5,500	51×46×23
SHOP FOX	W1745	1	3	6	4,800	50×46⅛×28
SUNHILL	SM-150	1	H	6	6,000	39×56×20½

1. (3) Three high-speed-steel straight knives
   (4) Four high-speed-steel straight knives
   (C) Carbide inserts in spiral configuration
   (H) Helical high-speed-steel knives
2. (K) Keyway slide
   (R) Rack-and-pinion gear
3. (F) Front-mounted handwheel
   (L) Lever
   (S) Side-mounted handwheel

Here's where we'd spend our money

Truth is, no jointer in this test fulfills our "dream list" of features and performance. So let's shop a la carte for a minute and build a fantasy 6" jointer. Here's what we want in our "Frankenjointer":

- The pedestal power switch and built-in mobile base of the Grizzly G0604X;
- The long bed and superb cut quality of the General International;
- The long, tall, rack-and-pinion fence of the Delta;
- The precise handwheels of the Jet;
- The power and belt-tensioning system of the Rikon;
- The Ridgid's depth scale;
- The durability and changing ease of the Grizzly G0452Z's carbide cutters;
- And the quiet performance of the Sunhill.

Because no manufacturer delivers all that within this price range, our pick for Top Tool is the Grizzly G0604X. It wasn't the best at everything, but it has the best combination of cut quality, power, and ease-of-use features, with a reasonable price.

The Ridgid JP0610 surprised us with its power and cut quality, earning the Top Value award. For a modest $430 we can live with its few quirks.

Written by **Bob Hunter** with **Bob Baker**
Illustrations: **Tim Cahill**

THE CHIPS ARE DOWN, YOUR BOARDS ARE FLAT AND SQUARE

TABLES		FENCE			TABLE ADJUSTMENT (3)			PERFORMANCE RATINGS (5)												ACCESSORIES (7)							
								PRIMARY				SECONDARY															
INFEED TABLE LENGTH, INCHES	OUTFEED TABLE LENGTH, INCHES	HEIGHT x LENGTH, INCHES	BEVEL STOPS, DEGREES	FRONT-TO-REAR ADJUSTMENT (2)	INFEED	OUTFEED	POWER SWITCH LOCATION (4)	POWER (6)	CUT QUALITY	FLATNESS OF TABLES	FLATNESS OF FENCE	EASE OF CHANGING KNIVES	EASE OF USING POWER SWITCH	EASE OF ELIMINATING SNIPE	CUTTER DURABILITY	EASE OF ADJUSTING TABLE HEIGHT	EASE OF ADJUSTING FENCE	ACCURACY OF BEVEL STOPS	EASE OF READING DEPTH SCALE	STANDARD	OPTIONAL	NOISE LEVEL, DECIBELS (6)	WEIGHT, LBS	CORD LENGTH	WARRANTY, YEARS	COUNTRY OF ASSEMBLY (8)	SELLING PRICE (9)
21⅛	23⅜	4½×29¼	45,90,135	K	L	S	P	B+	B-	B+	B+	b	a	a-	b	a	b-	c+	b	D,P		101	225	9'10"	1	C	$580
21⅛	23⅜	5×35	45,90,135	R	L	S	P	B	B-	A	A	b-	a-	b	b	a	a	a	c	D,P	T	93	225	7'7"	5	C	$600
27¼	27¼	4×29⅛	45,90,135	K	F	F	F	A	A	B+	B+	b-	a-	b	b	a	b-	a	b	D,P	C,T	94	260	8'1"	2	C	$600
30	24	4⅞×35⅛	45,90,135	K	L	L	P	A	A-	A	B+	b	a	a	b-	a	a	a	c-	D,M,P,T	C	98	320	7'6"	1	C	$575
22	22 ¼	5×35	45,90,135	R	L	S	P	C	B-	A	A	a	a	a	a	a	a	a	c	D,M,P		91	163	7'6"	1	C	$575
22	22¼	4×29⅛	45,90,135	K	F	F	F	A-	A	B+	A-	b+	b-	a	b	a	b-	a	b	D,P	T	95	215	6'3"	5	C	$600
22	22⅜	4×29⅛	45,90,135	K	S	S	F	A-	A-	B	B	b	b-	a-	b	b	a-	a	a	A,D,P		97	208	9'10"	3	T	$430
22¼	22½	4¾×29	45,90,135	R	F	F	P	A	A-	A-	A	b+	a-	a	b	a-	b-	b	a	D,P,T		99	258	5'10"	2	C	$575
22	22¼	4⅞×35	45,90,135	R	L	S	P	B	B-	A	A-	b-	a	b	b	a	a	a	c	D,M,P,T	C	97	163	5'10"	2	C	$530
27¼	27⅝	4×29⅛	45,90,135	K	L	S	F	A-	B-	A	B-	a-	b-	a	b-	a-	b-	a	b	D,P	C,S,T	91	198	6'8"	1	T	$550

4. (F) Front of jointer base
   (P) Pedestal mount

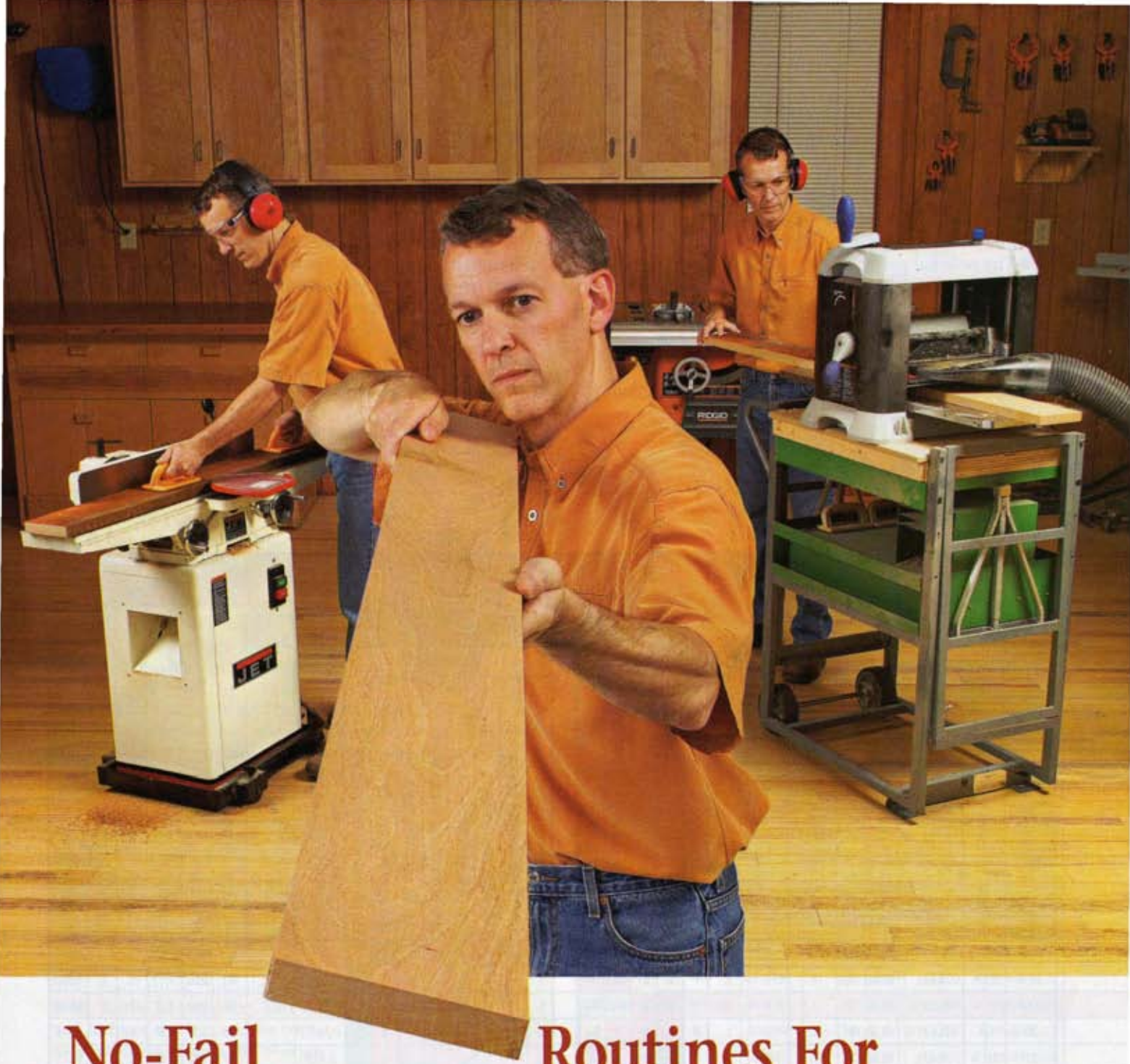
5. A Excellent
   B Good
   C Fair

6. Measured while face-jointing 6"-wide hard maple ⅛" and 1/16" deep.

7. (A) Fence angle-setting gauge
   (C) Spiral carbide cutterhead
   (D) 4" dust hood
   (M) Built-in mobile base
   (P) Push pads
   (S) Straight-knife cutterhead
   (T) Knife-setting tool

8. (C) China
   (T) Taiwan

9. Prices current at time of article production and do not include shipping, where applicable.



No-Fail Routines For Jointing and Planing

Here's the straight skinny on truing up stock for use in your projects.

Because they work in a similar fashion to remove stock from the face or edge of a board, the roles of the jointer and planer often cause confusion. Both help flatten and square up lumber, but they have distinct and different jobs. A jointer flattens one face of a board and squares up an adjacent edge—but it can't bring that board to consistent thickness. That's the planer's job. So a jointer and planer work together, much like love and marriage in the old song: You shouldn't have one without the other.

Flat, square stock begins on the jointer, so let's start there.

Jointing: a fundamental step for woodworking success

How a jointer works

As you can see in the Jointer Cutaway [**Drawing 1**], infeed and outfeed tables straddle a cylindrical cutterhead. The infeed table sits just lower than the top arc of the knives; the outfeed table sits flush with the top arc.

As you feed a workpiece into the cutterhead, the knives remove any portion of the board below the plane of the outfeed table. The jointed surface then passes smoothly onto the outfeed table. Each successive pass removes more wood until the cutterhead flattens the entire surface of the board.

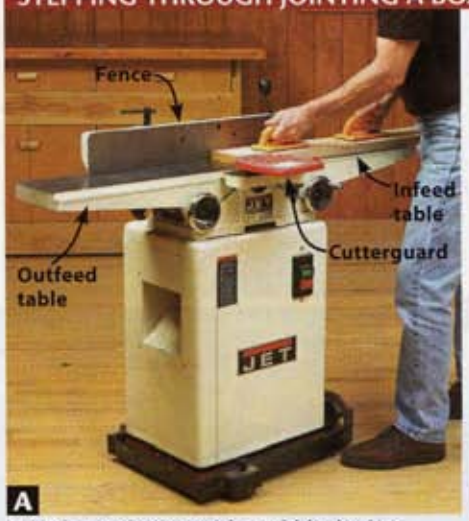
First, joint a face

Before jointing a board, sight along an edge to spot any bow or cup [**Drawing 2**] and to determine the grain direction. For the best results, feed the board across the jointer with the bow up so the board rides on its ends, cup facing down, and the grain running downhill from left to right [**Drawing 1**]. If the grain runs uphill, the cutting motion may follow the grain up into the board until small pieces break off. That's chip-out.

To face-joint the workpiece, set the infeed table for a cut of 1/16" deep or less. Rest the board on the infeed table, behind the cutterguard. Using pushblocks, move the board forward with just enough downward pressure to keep it in contact with the infeed table [**Photo A**]. Too much pressure flattens the cup or bow from the workpiece, only to have it return as soon as you lighten up.

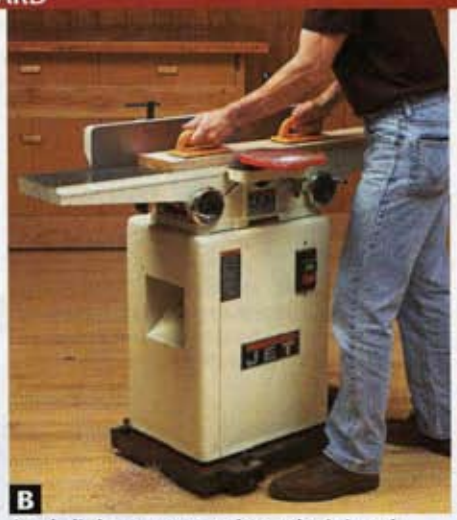
After about 6" crosses the cutterhead, move your left hand—and pressure—to the outfeed end of the workpiece [**Photo B**]. As the board reaches the end of the cut, move your right hand to the outfeed side and keep pushing the workpiece through to complete the cut [**Photo C**].

STEPPING THROUGH JOINTING A BOARD



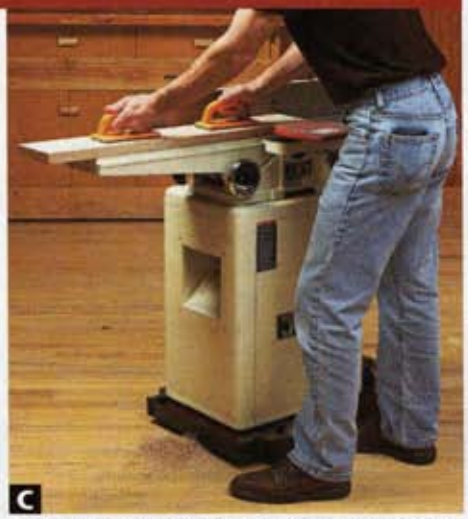
A

Grip the workpiece with pushblocks. Use most of your force to feed the board forward, not press it downward.



B

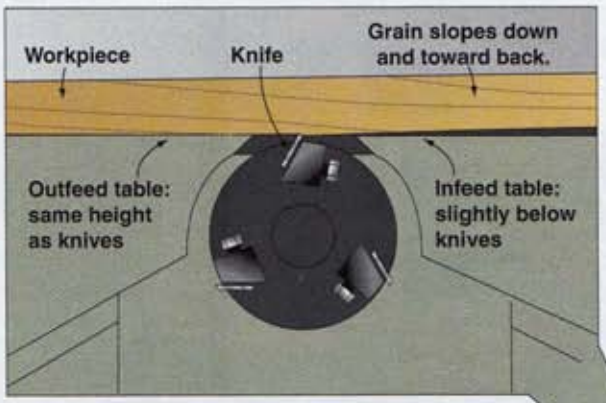
Apply light pressure to keep the jointed portion in contact with the outfeed table. Move the piece forward with both hands.



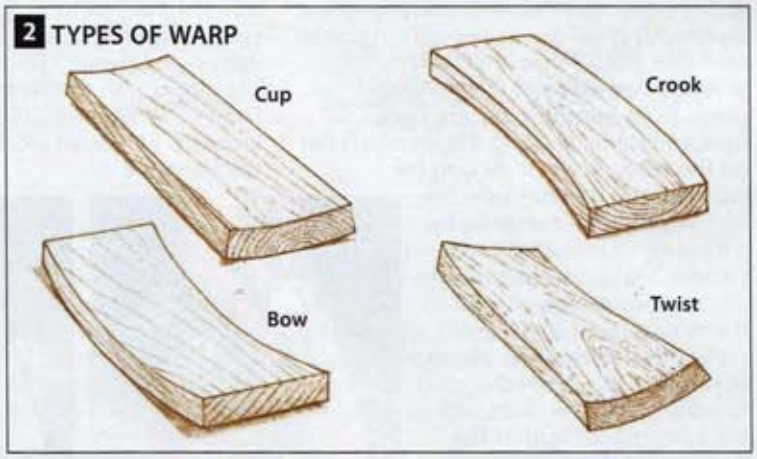
C

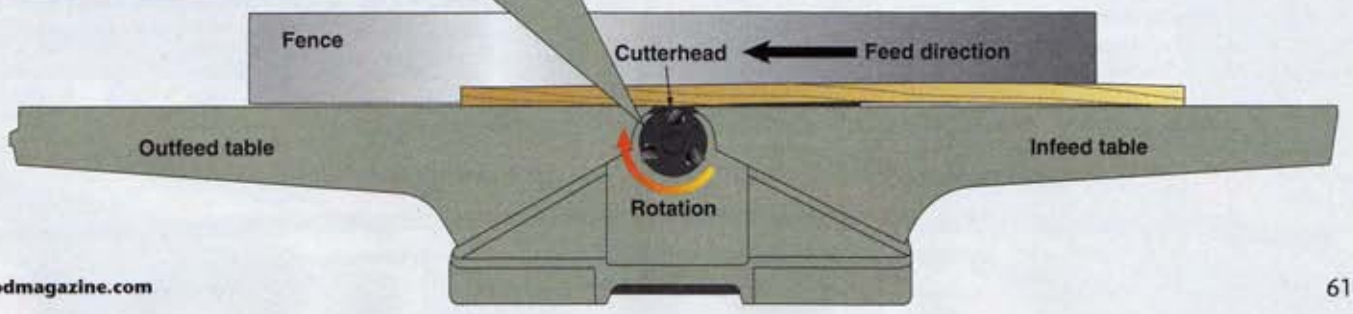
Reposition your hands as needed to press the jointed portions of the board onto the outfeed table. Feed the board past the cutterguard.

1 JOINTER CUTAWAY



2 TYPES OF WARP





You don't want to remove any more stock than necessary, so to track your progress, scribble a chalk line across the face to be jointed. If a piece has a pronounced cup or bow, the knives won't remove much material on the first pass [**Photo D**]. With repeated passes, though, the board gets flatter as the jointed surface grows larger. When the chalk line disappears, the face is flat.

Once a face is jointed flat, mark it as shown in the **Shop Tip** *above right*.

Next, square up an edge

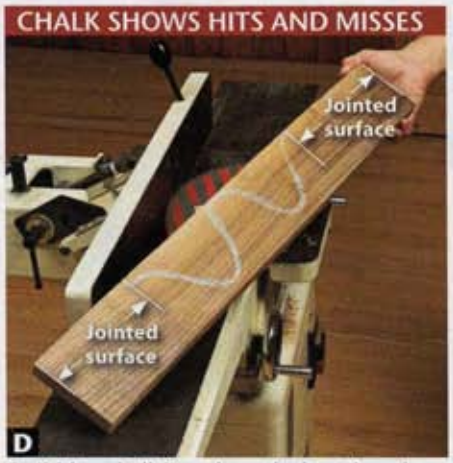
After flattening one face, the jointer makes easy work of squaring up an adjacent edge. Follow the same procedure as for jointing a face, with one addition: Firmly press the jointed face against the fence while feeding the board as before [**Photo E**]. If possible, orient the grain direction down and away from the cutterhead rotation to prevent chip-out [**Drawing 1**].

Mark the squared-up edge as shown in the **Shop Tip** *above right*. Then, with one face flat and one edge square, move on to the planer.

SHOP TIP

Marks keep things straight

As you machine stock, it can be hard to keep track of which face is flat and square to which edge. So after your last pass, mark the newly machined surface. Traditionally, cabinetmakers draw a curlicue on the jointed face, and a caret, or inverted "V", on the adjacent squared-up edge, with the point directed to the flattened face.



Scribble a chalk line along the length and width of a board to help track your progress. When the mark is gone, the face is flat.

Apply pressure in two directions: against the fence and forward across the cutterhead. For boards narrower than 4", use push blocks.

Jointer Pointers

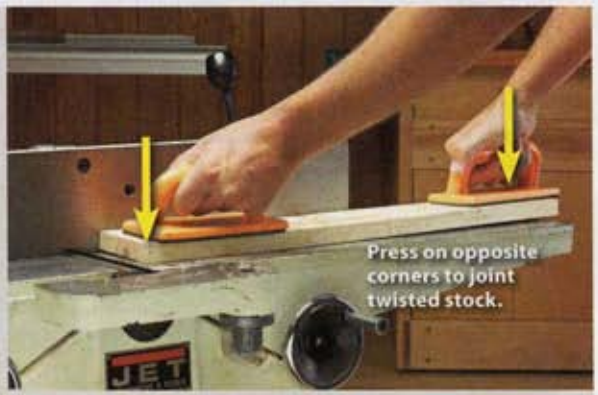
■ **Reduce waste and increase yield** by cutting boards to rough length and width before jointing. Less bow on the shorter, narrower pieces means fewer passes to flatten the board, as shown at *bottom*.

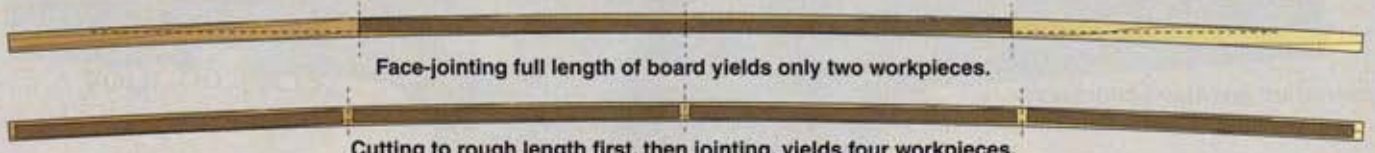
■ Get a **smoother face and reduce chip-out** by removing 1/32" or less per pass. A slower feed rate gives a smoother surface, too.

■ **Joint a twisted piece** by applying pressure on opposite corners, *right*. Concentrate on keeping those corners flat on the tables and not rocking the workpiece as it passes over the cutterhead. After making a few passes, the flattened corners provide a stable surface for the piece to ride on as you joint the remainder of the face.

■ When **jointing two pieces that will be edge-glued** together, joint one piece with the bottom face against the fence, *near right*, and the other with the top face against the fence, *middle right*. If the fence is slightly out of square to the table, the two angles offset each other, and the glued-up panel will be flat, *below far right*.

■ **Face-joint stock wider than your jointer** bed by ripping the board in half, jointing each piece, including the ripped edges, and then edge-gluing the pieces with the jointed faces flush. Rip badly cupped, crooked, or twisted stock on the bandsaw.




Face-jointing full length of board yields only two workpieces.
Cutting to rough length first, then jointing, yields four workpieces.

Planing: Create stock of any thickness

How a planer works

Unlike a jointer, a planer's cutterhead sits above the workpiece parallel to the table [**Drawing 3**]. Lowering the cutterhead between passes reduces the board to a uniform thickness.

At the planer, you don't control the workpiece during the cut. Instead, feed rollers on either side of the cutterhead push down on the workpiece while pulling it through the machine. That's why it's important to joint one face first: Without a flat face to ride against the planer tables, the feed rollers simply press the board flat against the tables while the knives plane the top face. Any cup, bow, or twist springs back once the board exits the planer.

Plane truths

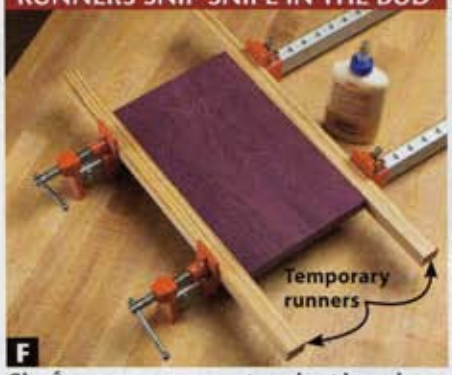
Again, consider grain direction when feeding stock into the planer. But remember that the planer cuts from the top, so the rules are reversed. To reduce chip-out, orient boards with the grain running uphill toward the back end [**Drawing 3**].

Removing 1/32" of material or less per pass also reduces chip-out. If you have a two-speed planer, shift to the slower feed rate for final passes to get a smoother surface. Set the depth of cut for a 1/64"-or-less "skimming cut" on the final pass for the same reason.

Lighter passes also decrease snipe—a divot at the start or end of a cut. To further decrease or even eliminate snipe, use your hands or support stands to keep a long board flat to the tables at the beginning and end of the cut. For short boards, glue on temporary runners, and rip them away after planing [**Photo F**].

For boards that require removing 1/8" or more to reach final thickness, after planing the top face flat, flip the board, and plane the jointed face. Continue alternating sides until reaching final thickness because removing similar amounts of stock from each face keeps the board stable, reducing warping.

RUNNERS SNIP SNIPE IN THE BUD

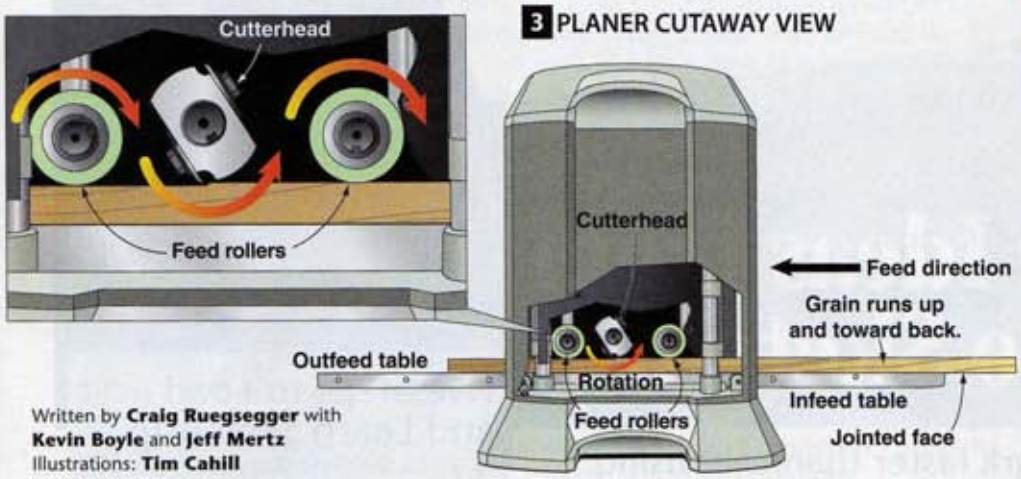


Glue temporary runners to a short board before feeding it through the planer. Any snipe will occur on the runners.

Still having problems? You might need to adjust

If you religiously follow all of the pointers in this article, yet still don't see good results when jointing or planing, your machine may be out of adjustment. All of the proper technique in the world won't fix that. If you suspect something's amiss with either machine, we have some solutions in a free online article at woodmagazine.com/tooltuneup.

3 PLANER CUTAWAY VIEW



Written by **Craig Ruegsegger** with **Kevin Boyle** and **Jeff Mertz**
Illustrations: **Tim Cahill**

MORE RESOURCES

FREE VIDEO

- "Prepping Stock With a Jointer and Planer" at woodmagazine.com/stockprepvid

FREE PLANS

- Jointer knife adjustment jig, jointer pushstick, auxiliary planer bed, edge-planing jigs, and more at woodmagazine.com/jointing

RELATED ARTICLES

- "Adjusting Jointer Knives," issue 165 (Oct. 2005)
- "Troubleshooting Jointers," issue 168 (Feb./Mar. 2008) $
- "Ten Tune-up Tips for Perfect Planing," issue 173 (Nov. 2006) $
- "Get the Most From Your Planer," issue 173 $

($ = Download this article from woodmagazine.com/plans for a small fee. Type "jointer" or "planer" in the Search box.)

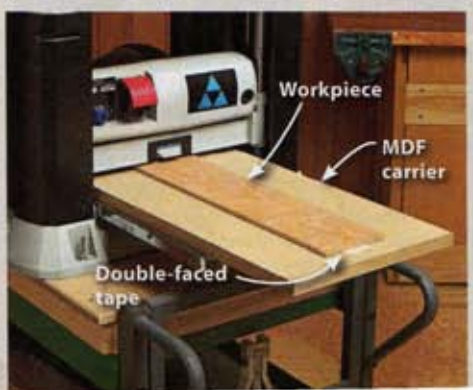
Planer Pointers

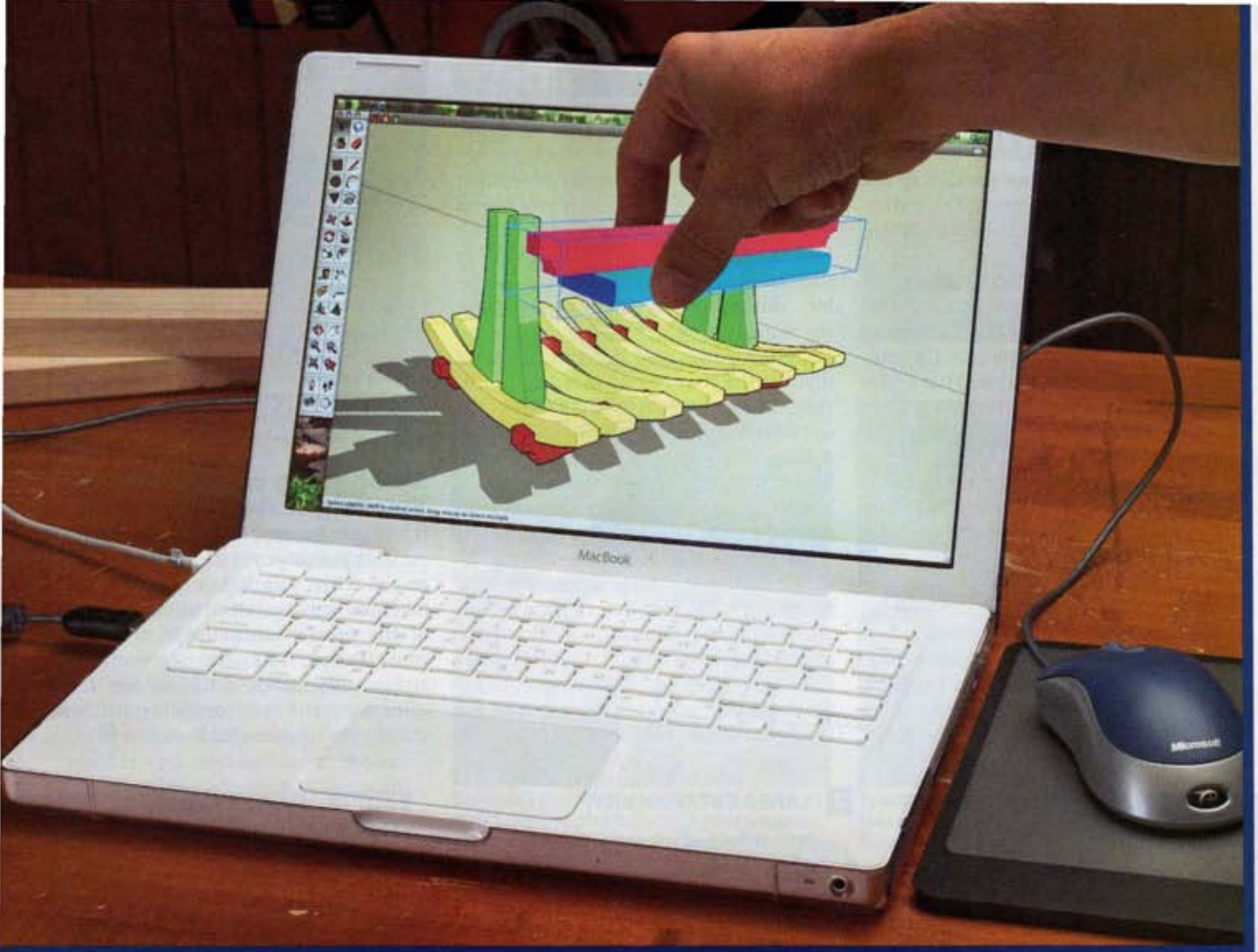
■ **Use a dust collector** to remove waste from the planer. Chips or debris caught between the workpiece and the feed rollers or tables can dimple the board.

■ Grain patterns sometimes change direction, and some species (such as maple) are just prone to chip-out. To **reduce chip-out**, feed the stock at a slight angle, *below left*. This also evens out wear across the length of the knives.

■ To **plane stock less than 1/4" thick**, double-faced-tape it to an MDF carrier, *below*. But don't plane stock to less than 1/8" thick. The knives can splinter the piece and shoot debris back at you.

■ To **bring several boards to identical width**, without the blade marks you might get from a tablesaw, stack several pieces face-to-face on their jointed edges; then feed the stack through the planer, *below*. Use this method only with stock thicker than 3/4" and a stack that is thicker than it is wide.





Take Your Ideas from Sketches to SketchUp

Capture your creative spark faster than ever using this powerful, easy-to-use (and free!) software.

I'd rather be working with wood—and I don't mean a pencil—than making drawings. But it's frustrating and wasteful to start a project without working drawings to guide me. Recently, I found something better than smudgy paper and guesswork. A free program called Google SketchUp has been getting lots of positive buzz on Internet software forums (including our own at woodmagazine.com/softwareforum). People with all levels of computer skills download SketchUp and put it to work the same day.

So I downloaded the program and gave myself a crash course in woodworking project design using an existing project—the napkin holder on page 18*—to practice my skills. Sure, there were some frustrating moments (though not as many as my first experience with a dovetail jig). But within a day, everything clicked (literally) and I moved on to create a book rack and a nightstand. Here's what I learned, and what you'll need to know to get great results of your own.*

Bob Wilson

—Techniques Editor

Five Steps to Load and Learn SketchUp

1 Go to sketchup.google.com, and click on "Downloads." Follow the instructions to download the free version of SketchUp. Then install the download.

2 Print the "Quick Reference" card found under the Help menu for an overview on how to activate each tool.

3 Open the Video Tutorials section and the "New to Google SketchUp" link. Watch the videos there to see the program in action.

4 Now it's time to learn by doing. At your own pace, complete the "Introduction to SketchUp" tutorial. Then, in that same section, complete the three "Start a Drawing" tutorials.

5 After that, spend a few hours simply exploring the program before you begin designing woodworking projects.

A new way of designing

SketchUp was meant for users who would rather design things than learn software. For example, a single mouse click pulls a two-dimensional shape into a three-dimensional object that can be copied with another click or two. You can even apply different wood grains to your model to decide whether it looks better in walnut or maple.

Sometimes, SketchUp seems to read your mind. When you're searching for the midpoint of a line, for example, the software's "inference engine" flashes a notice as your cursor nears that position and others within a drawing.

But in reality, no software will think for you. No warning bells go off if tenons in a joint measure ¼" too long, and it won't critique the proportions of a 1' wide by 8' tall bookcase. Also, a SketchUp drawing needs to be precise and detailed if you plan to build from it.

Master the SketchUp basics

Use the instructions *opposite* to download and install Google SketchUp* onto your PC or Mac. On-screen instructions will guide you through the process.

When you first run the program, it asks you to select the program's default settings. Choose **perspective view**, and set the **units** menu to read **Inches (Woodworking)-3D**. You can change settings later at **SketchUp ⇨ Preferences** in the menu bar. (Refer to the screen image shown *above center* if you're unfamiliar with these terms.)

Next learn the basics of SketchUp by mining Google's how-to library. Open **Help ⇨ Self-Paced Tutorials** and **Help ⇨ Video Tutorials**, and work through the lessons starting with *New to Google SketchUp*. The tutorials guide you in easy steps from introducing the program to making complex designs. For this article, you'll only need to complete the tutorials up through *Familiar with Google SketchUp*. If you'd like on-going reminders of what each tool does, activate **Window ⇨ Instructor**.

From the start, make it a habit to use time-saving mouse and keyboard shortcuts, shown at *right*. After you've learned to create a 3-D object and navigate around it, you're ready to apply these skills to a woodworking project.

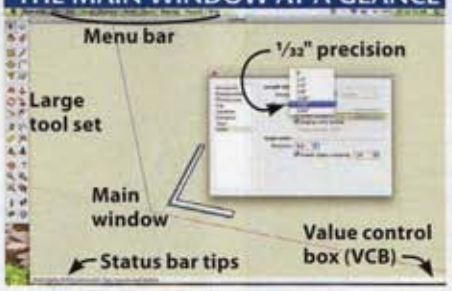
Learn by doing

To show you how SketchUp models an actual woodworking project, we'll use the napkin holder on *page 18* as a SketchUp model. That means we've already assigned dimensions to the parts. For a project designed from scratch, first work out the overall dimensions either on paper or on a rough model you can modify later.

Now it's time to fire up your computer, open SketchUp, and begin designing.

** SketchUp version 6 created the screen images shown. Version 7 released in November may look different. Both versions work with Windows or a Mac. To see if your machine can run version 7, check the system requirements on the downloads page at sketchup.google.com.*

THE MAIN WINDOW AT A GLANCE



When you first open Google SketchUp, take a minute to familiarize yourself with different elements of the main window.

Stretch Out Your SketchUp Skills

To learn more software tricks, share your designs, or to see what others are designing, visit *WOOD*® magazine's online software forum at woodmagazine.com/softwareforum. Other sites also worth a visit include:

- **SketchUp.google.com/3dwarehouse** for a look at downloadable models that include furnishings.
- **YouTube.com** hosts various how-to videos. Search "SketchUp, woodworking" for the latest.
- **Google.com/sketchup/download/bonuspacks.html** offers various collections of bonus materials.
- **IDX-design.com** provides a free program that creates photo-realistic models like the one shown *below left*.
- **Turnedoutright.com** supplies information on how to model turning projects with SketchUp.

SketchUp Keyboard Shortcuts

Eraser	E
Move	M
Offset	O
Paint Bucket	B
Push/Pull	P
Rotate	Q
Scale	S
Select	Space bar
Tape Measure	T
Zoom Extents	⇧Z
Arc	A
Circle	C
Line	L
Rectangle	R

And on the mouse...

Wheel: Roll the wheel forward to zoom in; roll it back to zoom out.

Wheel button: Click (press) and drag to orbit. Shift and click to pan. Double-click to center views using the cursor.

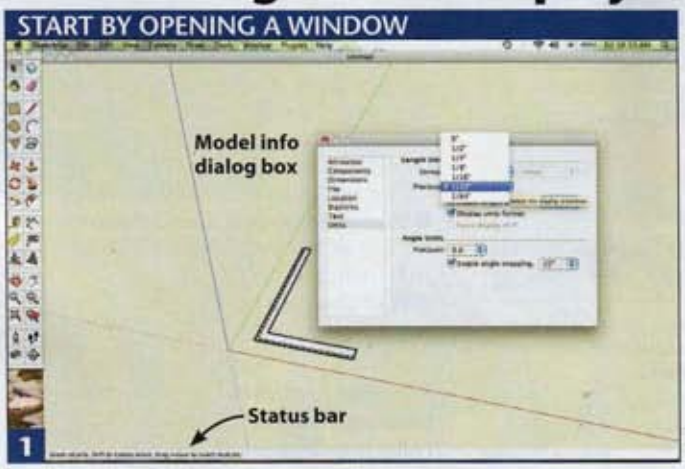
Right button: Click to open context menus.

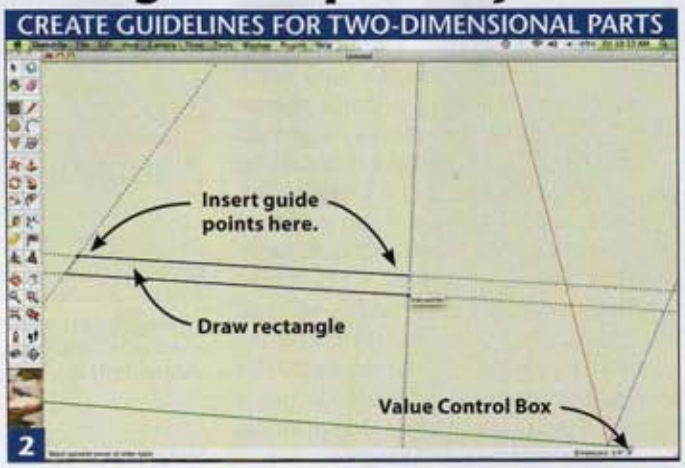
Left button: Select.

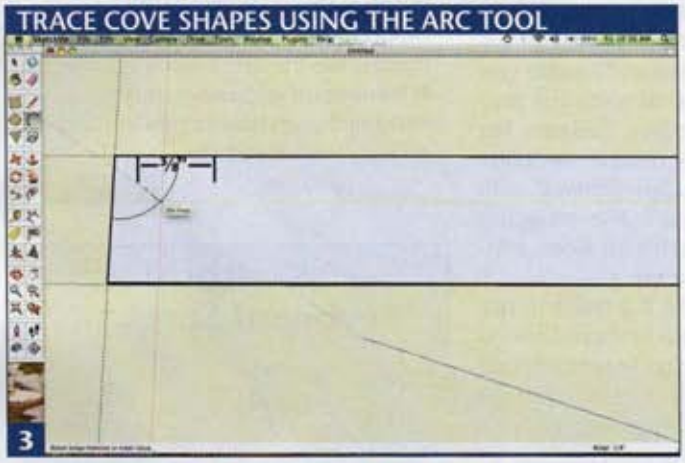
GIVE SKETCHES AN ADDED TOUCH OF REALISM

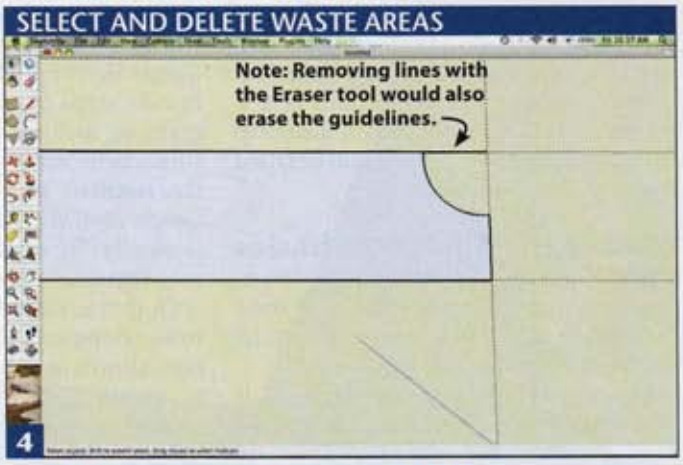
A free add-on called IDX Renditioner Express (idx-design.com) takes SketchUp colors and textures a step further. It enhances their realism and allows you to add natural or artificial light to visualize how a furniture project will look on display, all without leaving SketchUp.

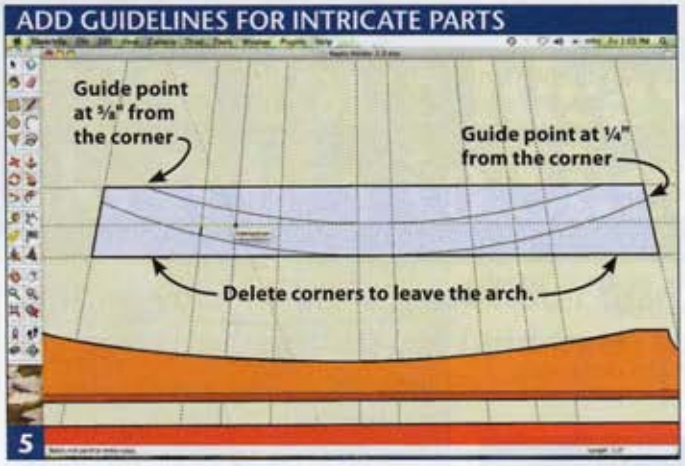
Learn Google SketchUp by Modeling a Sample Project

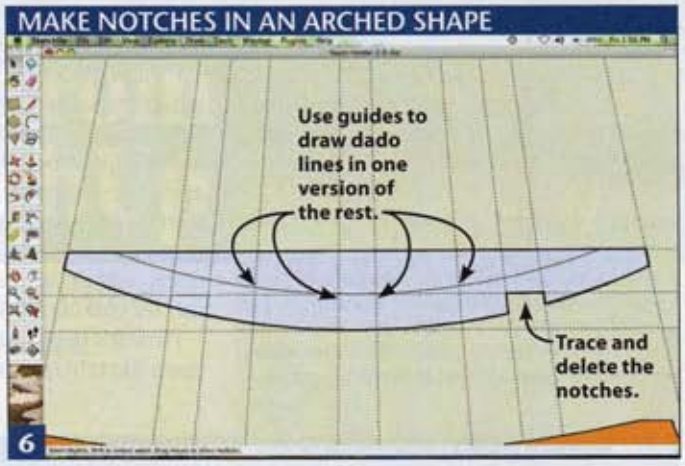









ADD GUIDELINES FOR INTRICATE PARTS
Guide point at 3/8" from the corner
Guide point at 1/4" from the corner
Delete corners to leave the arch.
5



1 To model the napkin holder, first create a new modeling window under the "Woodwórking" template. Use the **Window ➲ Model Info** dialog box to set the precision to 1/32". Then select and delete the square. Notice how the status bar tips change with each tool you select.

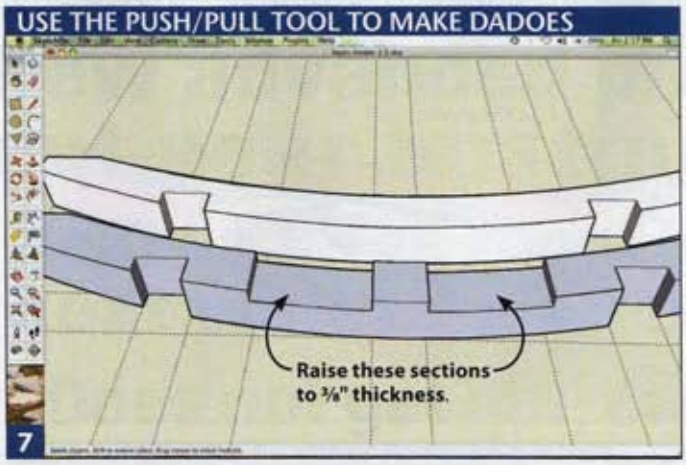
2 Measure from the red and green axes with the Tape Measure tool to create guides for the feet and retainer guide. (Or type the distances inside the Value Control Box.) Draw a rectangle within the guides with the Rectangle tool.

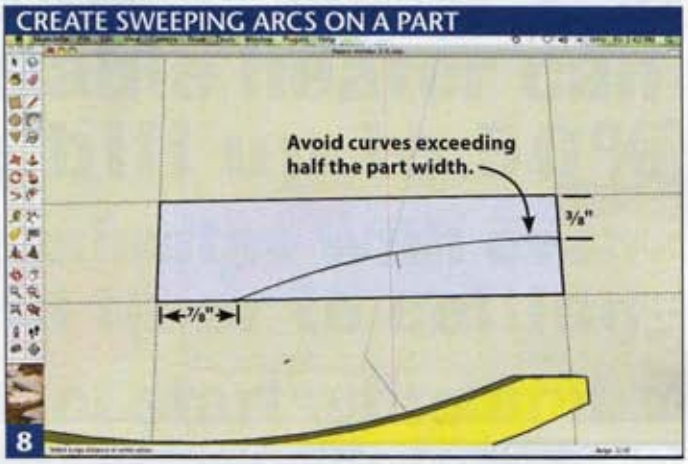
3 With the Tape Measure tool, insert guide points 3/8" from the corners on one long side. (Zoom in, if necessary.) Using the Arc tool, click on the guide points and move the mouse slowly until the arc snaps into position as a quarter circle.

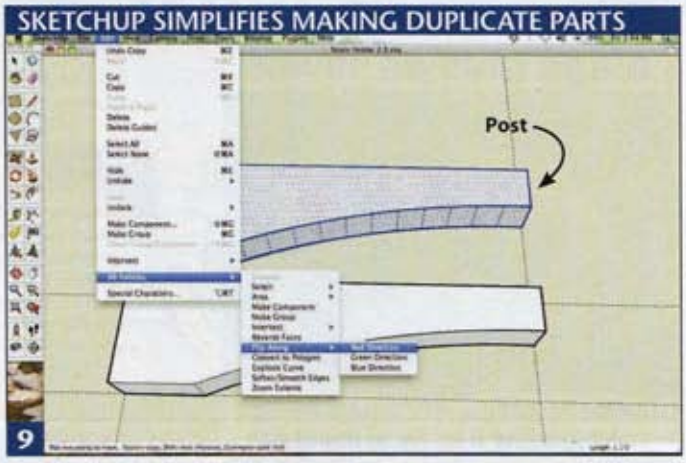
4 Use the Select tool to highlight one straight edge of a quarter circle. Use Delete—not the Eraser—to remove it and the face; then delete the other line. To duplicate this shape for the feet, select the rectangle and use the Move tool and Control key (Option on a Mac). After you complete the shapes of both the foot and retainer guide, Push/Pull them to 1/2" thick.

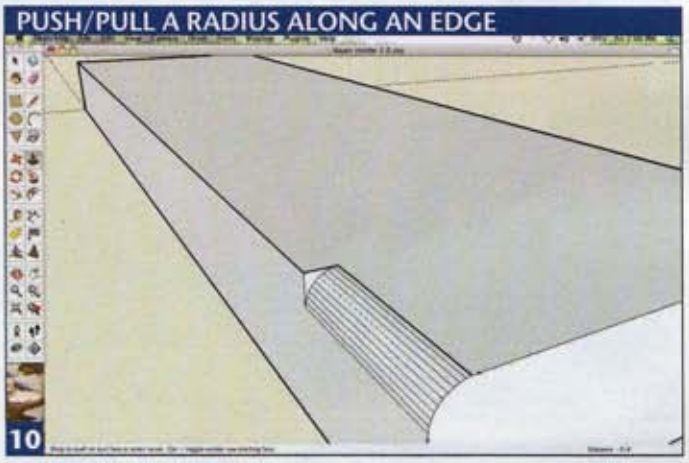
5 After drawing new guidelines and a rectangle for the rest, lay out parallel curves using guide points and the Arc tool. Select and delete the corners to create the arch shape.

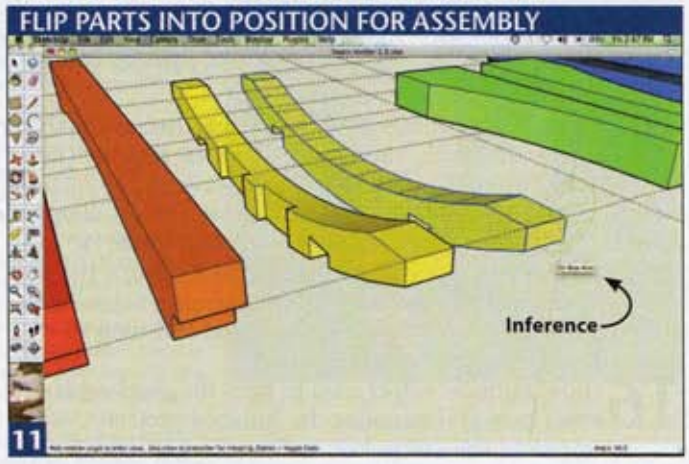
6 Use the Line tool to trace where the rectangles forming the notches overlap the arch, and delete those lines. Then finish the arch shape and make a duplicate. Use guidelines and the Line tool to draw dado line positions on one part.

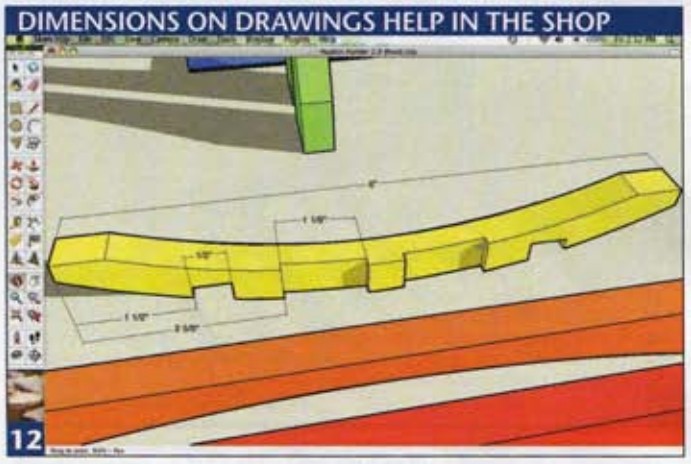












7 Use the Push/Pull tool to raise both rests to their ½" thickness. To create dadoes on the rests that will hold the posts, lower the sections between the lines drawn in **Step 6** by ⅛". With the parts completed, delete the guides.

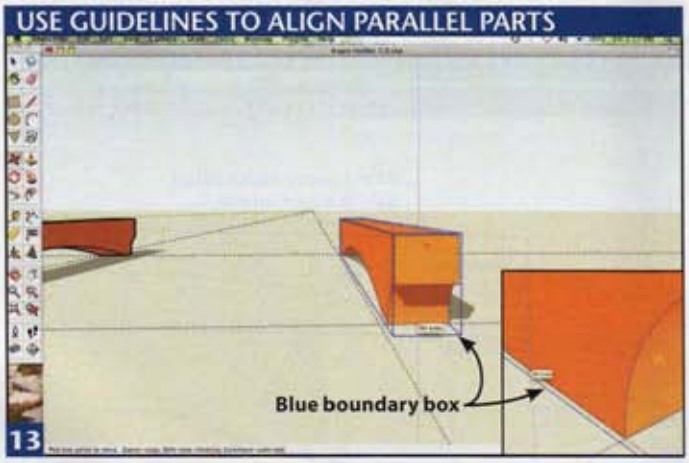
8 SketchUp doesn't draw parabolic curves, only circular ones. To draw this arc, add guide points where shown, and use the Arc tool to slowly pull the curve to the correct shape. Erase the waste area and pull the part to ½" thick.

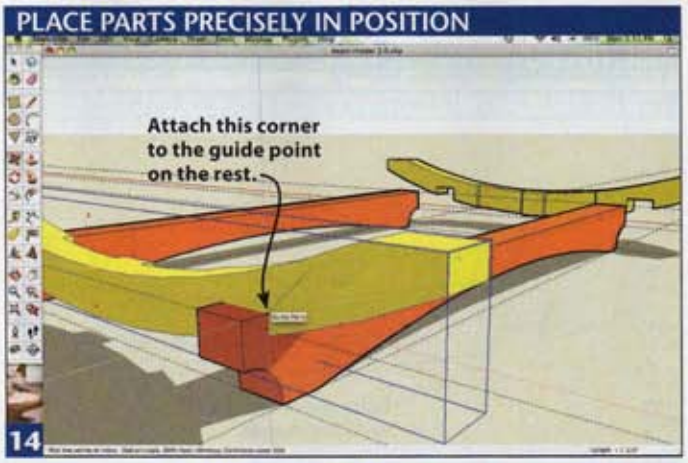
9 Sometimes you need to make mirror copies of a part, such as the post here. With the Move tool and Control key (Option on a Mac), duplicate the post and leave the copy highlighted. At **Edit ➪ (number) Entities**, choose **Flip Along** and **Red Direction** (in this case) to make a mirror version.

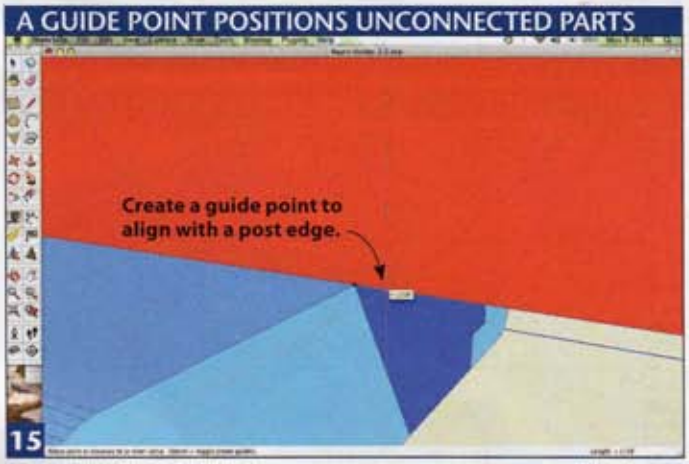
10 To round over edges, insert guide points on two adjoining end lines ⅛" from the corner. Draw a quarter circle at the corner between the guide points. Zoom in to ensure the arc doesn't extend beyond the end lines. Highlight the corner, and use the Push/Pull tool to drag the corner down to the opposite end where it will disappear. You'll see a series of closely-spaced parallel lines because SketchUp creates facets with flat faces, not true curves.

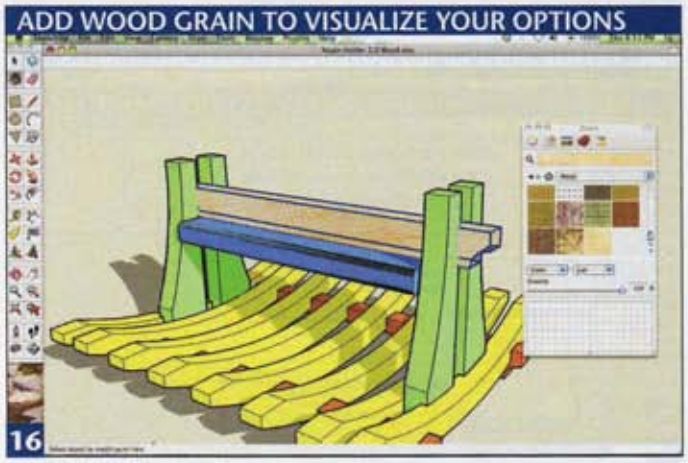
11 To prepare parts for assembly, first rotate them into position with the Rotate tool. As you rotate a part, check that it lines up with the correct axis, in this case the blue one. An inference appears when the angle matches the axis.

12 Because you'll eventually want to refer to these drawings when cutting actual parts, use the Dimension tool to add measurements. (Copies of parts won't include the dimensions.) To group the faces and lines forming each part, triple-click on one part face and click **Edit ➪ Make Group**.









13 Now let's virtually build the project. The napkin-holder feet are 4" apart, so create two parallel guidelines 4" apart and one perpendicular guideline to align the feet. When aligning grouped part faces or edges, ignore the blue boundary boxes (inset) identifying the part—they can't be aligned with a guide. Zoom in on the guides, and slide the edge of the foot to one guide and the end of the foot to the perpendicular intersecting guide. Double-check their placement with the Tape Measure. Measurements preceded by a tilde (~) means the distance is approximate; you may have a misaligned part.

14 To precisely position one part on another, use guide points and intersecting lines of grouped parts. For example, the rests on the napkin holder start ¼" from the ends of the feet. So, use the Tape Measure tool to insert a guide point ¼" from the end of the foot. Using the Move tool, lift and slide a copy of the end rest into approximate position. With the cursor on a corner of the notch, move the rest until the corner attaches itself to the guide point. Check the placement of the rest on the opposite foot. You can use a similar trick to attach the guides to the end rest.

15 When you want two parts to stay together, group them as we did with the napkin holder retainer using **Edit ➪ Make Group**. To allow a 1/16" gap between the retainer and the posts on both ends, use the Tape Measure tool to add a guide point to the lower edge of the retainer guide 1/16" from the end of the retainer. Slide the guide point against the post edge as you insert the retainer/guide assembly between the guides on each end. Now use the Orbit and Pan tools to view your completed model from every angle.

16 Those rainbow colors used to keep the parts separated won't help you visualize the finished project. Use the wood samples in the Colors box or download our assortment of wood grains from woodmagazine.com/woodgrain. Right click on each grouped part and choose **Explode**. Immediately assign a wood tone using the Paint tool, and regroup it.

17 Using maple and walnut wood grains, where listed in the napkin holder story, give the model a more realistic look. For a more detailed look at assembling this napkin holder model, go to woodmagazine.com/napkinholder for an online slide show.

Sources

SketchUp: Free version from sketchup.google.com; Google SketchUp Pro 6, $495.
Instruction guide: *Google SketchUp for Dummies* by Aidan Chopra, $16.49 from Amazon.com.

Written by **Bob Wilson** with **Michael Burns**

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AS HEARD ON PAUL HARVEY NEWS

New advanced portable heater can cut your heating bill up to 50%

Heats a large room in minutes with even heat wall to wall and floor to ceiling

Does not get hot, cannot start a fire and will not reduce humidity or oxygen

A new advanced quartz infrared portable heater, the EdenPURE™, can cut your heating bills by up to 50%.

You have probably heard about the remarkable EdenPURE™ as heard on Paul Harvey News and on television features across the nation.

The EdenPURE™ can pay for itself in a matter of weeks and then start putting a great deal of extra money in your pocket after that.

A major cause of residential fires in the United States is portable heaters. But the EdenPURE™ cannot cause a fire. That is because the quartz infrared heating element never gets to a temperature that can ignite anything.

The outside of the EdenPURE™ only gets warm to the touch so that it will not burn children or pets. Pets can sleep on it when it is operating without harm.

The advanced space-age EdenPURE™ Quartz Infrared Portable Heater also heats the room evenly, wall-to-wall and floor-to-ceiling. And, as you know, portable heaters only heat an area a few feet around the heater.

Unlike other heating sources, the EdenPURE™ cannot put poisonous carbon monoxide into a room or any type of fumes or any type of harmful radiation.

Q. What is the origin of this amazing heating element in the EdenPURE™?

A. This advanced heating element was discovered accidentally by a man named John Jones.

Q. What advantages does infrared quartz tube heating source have over other heating source products?

A. John Jones designed his heating source around the three most important consumer benefits: economy, comfort, and safety.

In the EdenPURE™ system, electricity is used to generate infrared light which, in turn, creates a very safe heat.

Never be cold again

Cannot start a fire; a child or animal can touch or sit on it without harm

After a great deal of research and development, very efficient infrared heat chambers were developed that utilize three unique patented solid copper heat exchangers in one EdenPURE™ heater.

Q. How can a person cut their heating bill by up to 50% with the EdenPURE™?

A. The EdenPURE™ will heat a room in minutes. Therefore, you can turn the heat down in your house to as low as 50 degrees, but the room you are occupying, which has the EdenPURE™, will be warm and comfortable. The EdenPURE™ is portable. When you move to another room, it will quickly heat that room also. This can drastically cut heating bills, in some instances, by up to 50%.

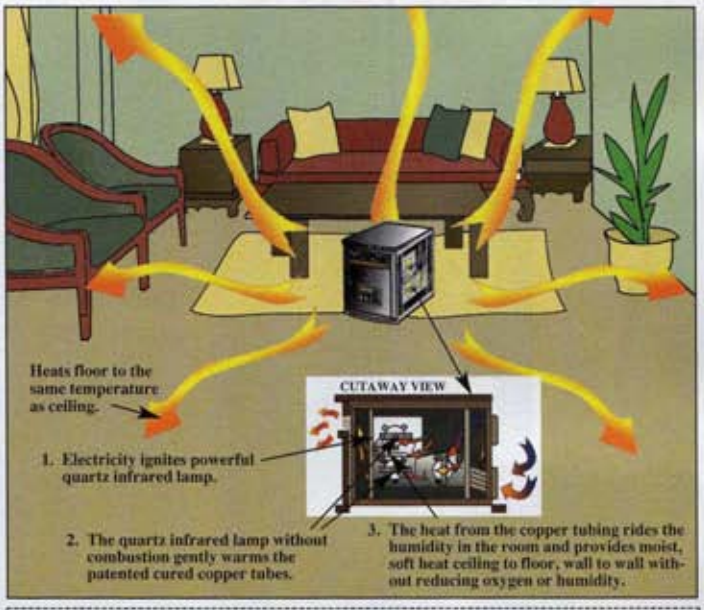
The EdenPURE™ comes in 2 models. GEN3 Model 500 heats a room up to 300 square feet and GEN3 Model 1000 heats a room up to 1,000 square feet.

End of interview.

The EdenPURE™ will pay for itself in weeks. It will put a great deal of extra money in a users pocket. Because of today's spiraling gas, oil, propane, and other energy costs, the EdenPURE™ will provide even greater savings as the time goes by.

Readers who wish can obtain the EdenPURE™ Quartz Infrared Portable Heater at a $75 discount if they order in the next 10 days. Please see the Special Readers Discount Coupon on this page. For those readers ordering after 10 days from the date of this publication, we reserve the right to either accept or reject order requests at the discounted price.

How it works:


Heats floor to the same temperature as ceiling.
CUTAWAY VIEW
1. Electricity ignites powerful quartz infrared lamp.
2. The quartz infrared lamp without combustion gently warms the patented cured copper tubes.
3. The heat from the copper tubing rides the humidity in the room and provides moist, soft heat ceiling to floor, wall to wall without reducing oxygen or humidity.

SPECIAL READER'S DISCOUNT COUPON

The price of the EdenPURE™ GEN3 Model 500 is $372 plus $17 shipping for a total of $389 delivered. The GEN3 Model 1000 is $472 plus $27 shipping and handling for a total of $499 delivered. People reading this publication get a $75 discount with this coupon and pay only $297 delivered for the GEN3 Model 500 and $397 delivered for the GEN3 Model 1000 if you order within 10 days. The EdenPURE™ comes in the decorator color of black with burled wood accent which goes with any decor. There is a strict limit of 3 units at the discount price - no exceptions please.

Check below which model and number you want:

☐ GEN3 Model 500, number _____ ☐ GEN3 Model 1000, number _____

- To order by phone, call TOLL FREE **1-800-588-5608 Ext. EPH9507**. Place your order by using your credit card. Operators are on duty 24 hours, 7 days.
- To order online, log on to www.epheater.com
- To order by mail, by check or credit card, fill out and mail in this coupon.

This product carries a 60-day satisfaction guarantee. If you are not totally satisfied, your purchase price will be refunded. No questions asked. There is also a three year warranty.

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Check below to get discount:

☐ I am ordering within 10 days of the date of this publication, therefore I get a $75 discount and my price is only $297 for GEN3 Model 500 and $397 for GEN3 Model 1000 delivered.

☐ I am ordering past 10 days of the date of this publication, therefore I pay shipping and handling and full price totaling $389 for GEN3 Model 500 and $499 for GEN3 Model 1000.

Enclosed is $_____ in: ☐ Cash ☐ Check ☐ Money Order
(Make check payable to BioTech Research) or charge my:

☐ VISA ☐ MasterCard ☐ Am. Exp./Optima ☐ Discover/Novus

Account No. _____ Exp. Date ___/___

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MAIL TO: BioTech Research Dept. EPH9507
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Faux Walnut

Stacking Shelves

Family room, dorm room, *any* room: These easy-to-build shelves work wherever you need versatile, customizable storage.

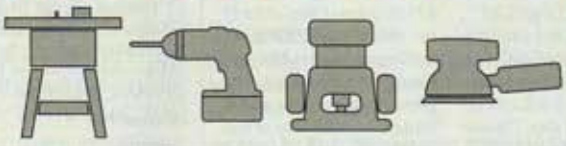
BASIC-BUILT™
GREAT PROJECTS MADE SIMPLE.

Dimensions of one unit:
31¾" wide x 36¾" high x 15¼" deep

Here's a project as easy to customize as it is to construct. Movable shelves rest at your choice of five heights. Stack two units, as shown *above*, for a lot of storage or display area in a little floor space. Add another unit to create a workspace. When your needs change, just rearrange the set for a new custom solution, *opposite*.

The quantities mentioned in the instructions are for one unit with three shelves; adjust as needed for the number of shelves and units you plan to build, and then cut all the like pieces at the same time.

WHAT YOU'LL NEED



Materials: 1½" poplar, ¾" poplar; ¾", ¼" birch plywood; ¼" rabbeting, 45° chamfer router bits.

Hit the rails

1 Cut four ¾×6½×12" blanks for the rails (A). Chuck a ¼" rabbeting bit

A set of shelves placed side-by-side creates display space that doubles as a home entertainment center. Create your own arrangement by building as many units as you want, and then customizing each one by varying the number of shelves and the shelf positions.

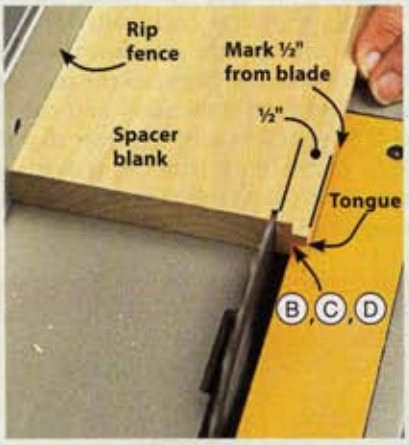
Clamp a rail blank to the bench. Rout a ¼×¼" rabbet along each face at both ends to create ¼"-thick stub tenons.

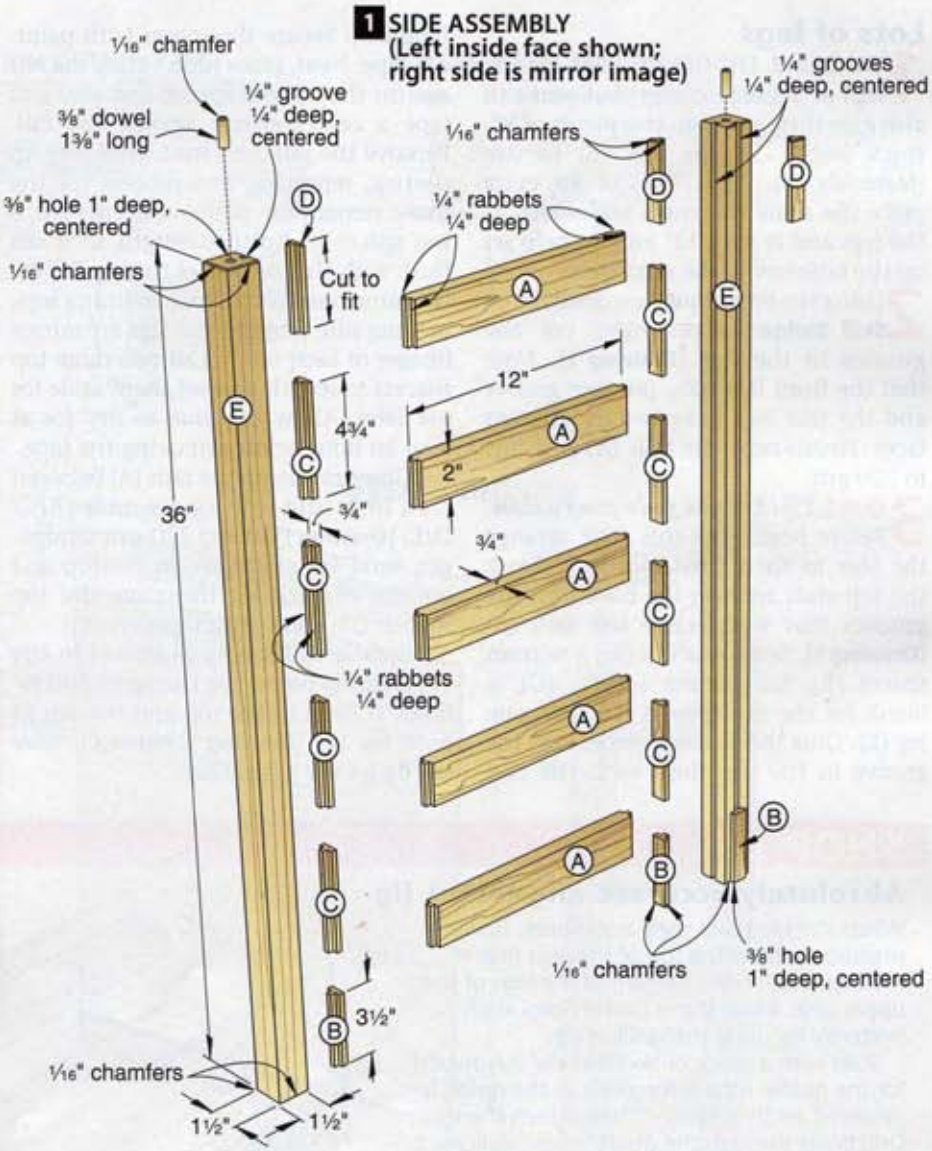
SHOP TIP

Rip thin strips safely

Ripping thin strips between the blade and fence begs for trouble in the form of strips kicking back at you. Instead, rip the spacer blank so the good piece falls to the outside of the blade.

First, make a mark on the table ½" from the outside edge of the blade. Extend the mark beyond the front of the blade. Align the edge of the tongue with this mark, slide the rip fence against the opposite edge of the stock, and rip a blank free. Readjust the fence to cut away the next blank.



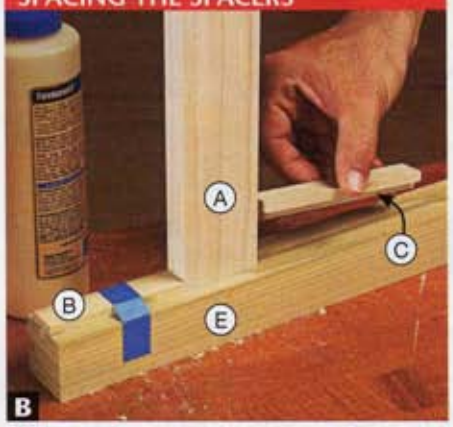


into your router, and rout stub tenons on both ends of each blank [**Drawing 1, Photo A**]. (Save the router setup for use in the next step.) Rip ten 2"-wide rails (A) from the blanks.

2 Prepare a ¾×4½×28" blank for the bottom spacers (B), center spacers (C), and top spacers (D) [**Drawing 1**]. Using the router setup you saved, rout rabbets on each face to create a tongue along each long edge of the blank. Then rip a ½"-wide strip from each edge [**Shop Tip,** *above left*]. Form tongues on the blank edges again and repeat the process until you have six ½"-wide blanks. (Save the router setup for use later.) Finish-sand these blanks to 220 grit.

3 From the blanks, cut the bottom spacers (B) and center spacers (C) to finished length [**Drawing 1**]. Set the spacers and the unused blanks aside. The top spacers (D) will be cut from the remaining blanks later.

SPACING THE SPACERS



Painter's tape secures the spacers (B, C, D) while the glue dries. Don't nudge the spacers as you place and remove the rail (A).

SKILL BUILDER

Cut precisely centered grooves

Forget tedious measuring and layout. These simple steps guarantee grooves perfectly centered on a workpiece.

First, mount a rip blade in the tablesaw and position the rip fence to roughly center the blade on the width of a leg (E). Raise the blade ¼" above the table, and cut a groove along the length of the test scrap. Rotate the scrap end for end to put the opposite face against the fence, and make a second pass to widen the groove (photo).

Check the fit of the tongue into the groove on a spacer (B, C). Nudge the fence as needed and repeat the process until the stub tenon fits snugly in the groove.

Lots of legs

1 We found 1½"-thick poplar for the legs at a home center, but you can also glue them up from two pieces of ¾"-thick stock. Cut the legs (E) to size [**Materials List**, *page 74*]. Cut an extra piece the same thickness and width as the legs and at least 12" long to help set up the tablesaw in the next step.

2 Using the technique described in the **Skill Builder**, *above right*, cut the grooves in the legs [**Drawing 1**]. Note that the front legs have just one groove and the rear legs have two in adjacent faces. Finish-sand the rails (A) and legs to 220 grit.

3 ***Quick Tip! Labels save confusion.*** Before beginning this step, arrange the legs in their final locations. Mark the top ends and, on the back legs, the grooves that will receive the rails (A) [**Drawing 1**]. Retrieve a rail (A), a bottom spacer (B), four center spacers (C), a blank for the top spacers (D), and one leg (E). Glue the bottom spacer into the groove in the leg, flush with the end [**Photo B**]. Secure the spacer with painter's tape. Next, place (don't glue) the rail against the bottom spacer, and glue and tape a center spacer against the rail. Remove the rail, and work your way up the leg, repeating this process for the three remaining center spacers. Cut a top spacer to finished length so it sits flush with the top end of the leg. Follow the same routine for the remaining legs, making sure that the rear legs are mirror images of each other. Cut two more top spacers to length and set them aside for use later. Allow the glue to dry for at least an hour before removing the tape.

4 Glue and clamp the rails (A) between a front and rear leg assembly (B/C/D/E) [**Drawing 1**]. Using 220-grit sandpaper, sand 1/16" chamfers on the top and bottom of each leg including the top spacers (D) and bottom spacers (B).

5 Build a drilling jig as shown in the **Shop Tip** *below*. Use the jig to drill ⅜" holes 1" deep in the top and bottom of each leg (E) [**Drawing 1, Photo C**]. Save the jig for use again later.

Back it up

1 Cut a ¾×4¼×28½" blank for the back rails (F). Retrieve the router and rabbeting bit from earlier, and rout stub tenons on each end of the blank [**Drawing 2a**]. Move to the tablesaw and rip the back rails from the blank [**Drawing 2**].

2 Using the same procedure used to cut the grooves in the legs (E), cut a groove in one edge of each back rail (F) to accept the ¼" plywood back panel (G) [**Drawing 2a**].

3 Retrieve the two extra top spacers (D) and two bottom spacers (B). Glue them into each rear leg (E), flush at the ends. Tape them in place and allow the glue to dry.

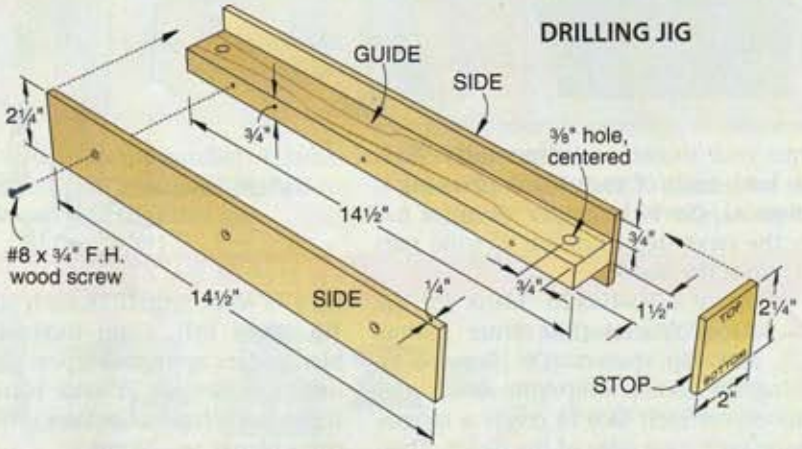
4 Dry-fit the side assemblies (A/B/C/D/E) with the back rails (F) snug against the spacers. Measure between the back rails and between the rear legs. Add ⅜" to each dimension and cut the back panel (G) to this size. Note that the grain of the back panel runs horizontally. Finish-sand the back rails and back panel to 220 grit.

SHOP TIP

Absolutely-accurate alignment jig

When stacking two shelf assemblies, dowels protruding from the top of the legs fit into mating holes in the bottom of the legs of the upper unit. Make those dowel holes align perfectly by using this drilling jig.

Start with a piece of ¾×1½×14½" hardwood for the guide. Attach the sides so the guide is centered on their width. Then attach the stop. Drill holes through the guide where indicated. Mark one edge of the stop as the top and the other as the bottom. When drilling the tops of the legs, place the edge labeled "top" over the legs. When drilling the bottom ends, place the edge labeled "bottom" over the legs. This ensures the holes will line up between units.



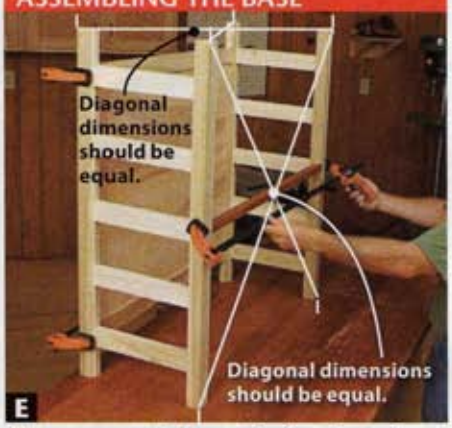
MATCH HOLES PERFECTLY

Wrap a tape flag 1¾" above the tip of the drill bit to indicate the hole's final depth. Drill straight into the leg (E).

ASSEMBLING THE BACK

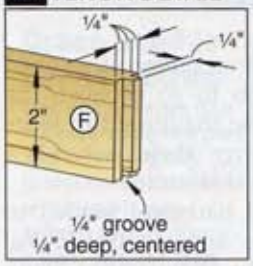
Apply glue to the upper two-thirds of the grooves in the back rails (F). The back panel (G) will spread it down as it slides into place.

ASSEMBLING THE BASE

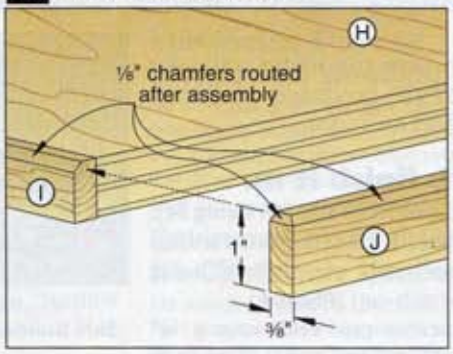


Clamp a spacer between the front legs; then check for square by measuring diagonally across the top and the front.

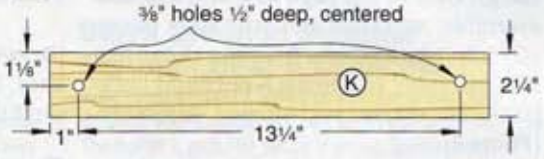
2a TENON DETAIL



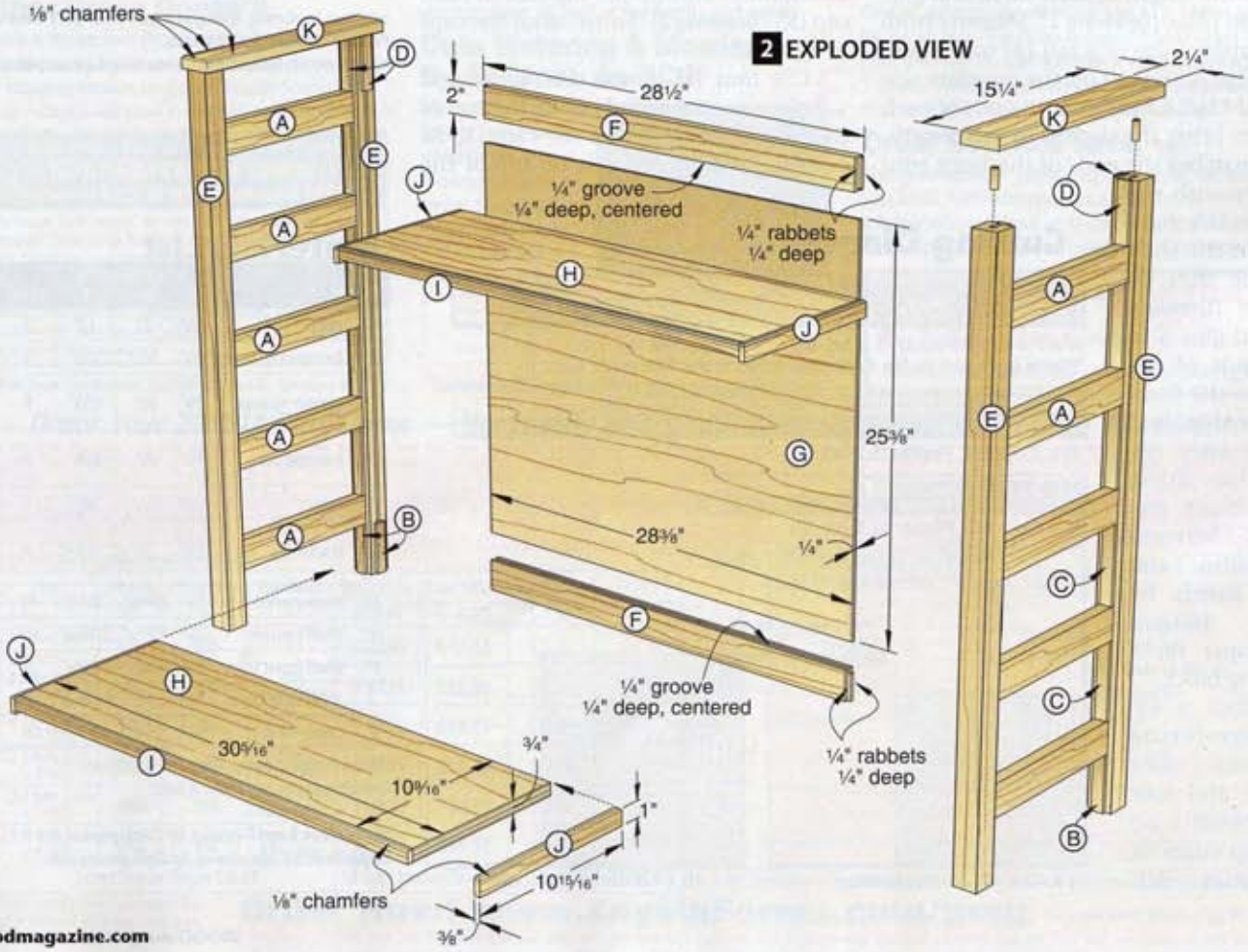
2b SHELF TRIM DETAIL

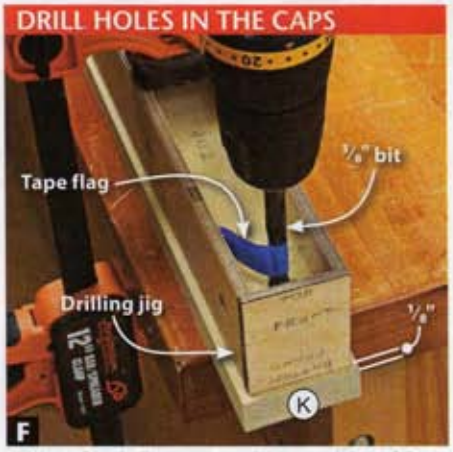


2c CAP BOTTOM VIEW



2 EXPLODED VIEW





Center the drilling jig on the cap's (K) width with the stop ⅛" from the end. Clamp the jig and cap to the bench before drilling the holes.

5 Glue the back rails (F) into one side assembly (A/B/C/D/E). Apply glue to the grooves in the back rails and the side assembly, and then slide the back panel (G) into place [**Photo D**]. Glue the other side assembly to the back rails and back panel to create a U-shaped assembly [**Photo E**].

Shelves lock it together

1 Cut three shelf panels (H) from ¾" plywood to 10⁹⁄₁₆×30½". (The shelves will be trimmed to final length later.) Cut the shelf front trim pieces (I) to match the length of each shelf, and glue them in place [**Drawing 2**]. Measure from the outside edge of a rail (A) to the outside edge of the rail on the opposite side and add ⅛". Crosscut both ends of each shelf to bring the shelves to this length. This matches the ends of the front trim exactly with the ends of the shelf.

2 Cut the shelf side trim (J) to size [**Drawing 2**], and glue it to the ends of the shelves (H) flush at the top and front. After the glue has dried, smooth out any ridges between the trim and shelf panels by using 150-grit sandpaper on a sanding block.

3 Chuck a 45° chamfering bit into your router, and rout ⅛" chamfers on the top edges of the trim (I/J) [**Drawing 2b**]. Save the router setup for later. Use 220-grit sandpaper to finish-sand the shelves and trim.

Cap it off, finish it up

1 Cut two caps (K) to size [**Drawing 2c**]. Position the drilling jig on the bottom face of each cap, and drill ⅜" holes ½" deep into each cap [**Photo F**].

2 Starting across one end, rout a ⅛" chamfer around the top face of each cap (K) [**Drawing 2**]. Finish-sand the caps to 220 grit.

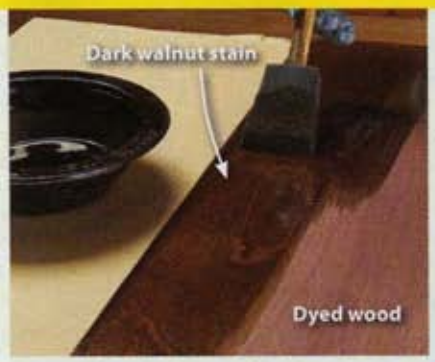
3 Cut four ⅜" dowels 1⅜" long, and place one in each hole in the top of each leg (E). Check that the caps (K) fit onto the dowels and rest on top of the legs. To stack one unit on top of another, cut 2"-long dowels to go between the units. **Do not** glue the dowels in place so you can change them out when reconfiguring the shelf units.

4 Make sure all parts are sanded to 220-grit; then apply a finish. We turned our poplar shelves into "faux walnut" using the method shown in the **Skill Builder** *above*.

Written by **Craig Ruegsegger** with **Jeff Mertz**
Project design: **Jeff Mertz**
Illustrations: **Roxanne LeMoine; Lorna Johnson**

SKILL BUILDER

The "Rit" touch creates the look of walnut



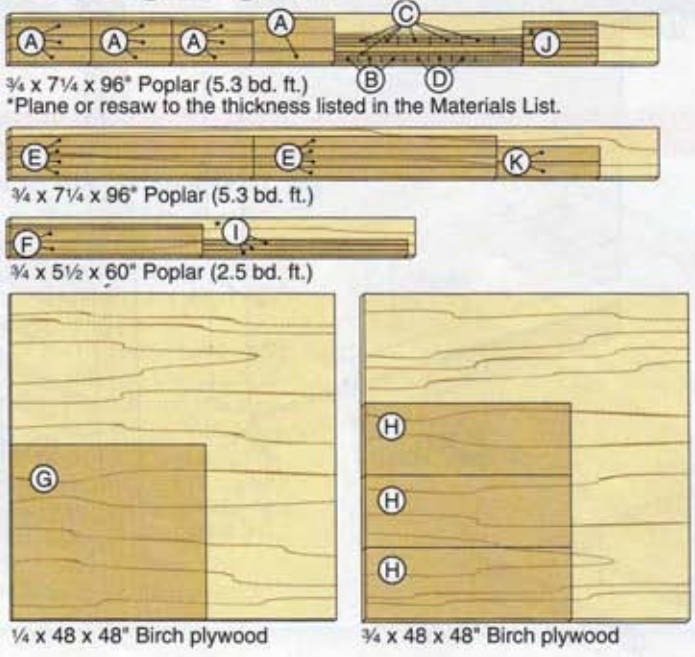
On poplar, stain alone looks blotchy and doesn't have the rich look of walnut. A base coat of inexpensive fabric dye fixes the problem.

First, wet the surface of the wood with a damp sponge or rag. Sand lightly with 220-grit sandpaper to remove the raised grain.

Following the directions on the package, mix one envelope of Rit Dark Brown dye. Use a foam brush to apply an even coat of the dye to all pieces. The dyed wood may have a purple hue, but this will change during staining (photo).

Let the dye dry completely, at least overnight. Then apply a stain. We used Minwax Dark Walnut no. 2716. Allow the stain to dry thoroughly. Lastly, apply two coats of a wipe-on polyurethane, sanding lightly with a 320-grit sanding sponge between coats.

Cutting Diagram



Materials List

Part		FINISHED SIZE T	W	L	Matl.	Qty.
A*	rails	¾"	2"	12"	P	10
B*	bottom spacers	¾"	1½"	3½"	P	6
C*	center spacers	¾"	1½"	4¾"	P	16
D*	top spacers	¾"	1½"	3½"	P	6
E	legs	1½"	1½"	36"	P	4
F*	back rails	¾"	2"	28½"	P	2
G	back panel	¼"	25⅜"	28⅜"	BP	1
H*	shelf panels	¾"	10⁹⁄₁₆"	30⁵⁄₁₆"	BP	3
I*	shelf front trim	⅜"	¾"	30⁵⁄₁₆"	P	3
J	shelf side trim	⅜"	1"	10¹⁵⁄₁₆"	P	6
K	caps	¾"	2¼"	15¼"	P	2

*Parts initially cut oversize. See the instructions.
Quantities are for one shelving unit.

Materials key: P-poplar, BP-birch plywood.
Supplies: ⅜"-dia. dowel, Rit Dark Brown dye.

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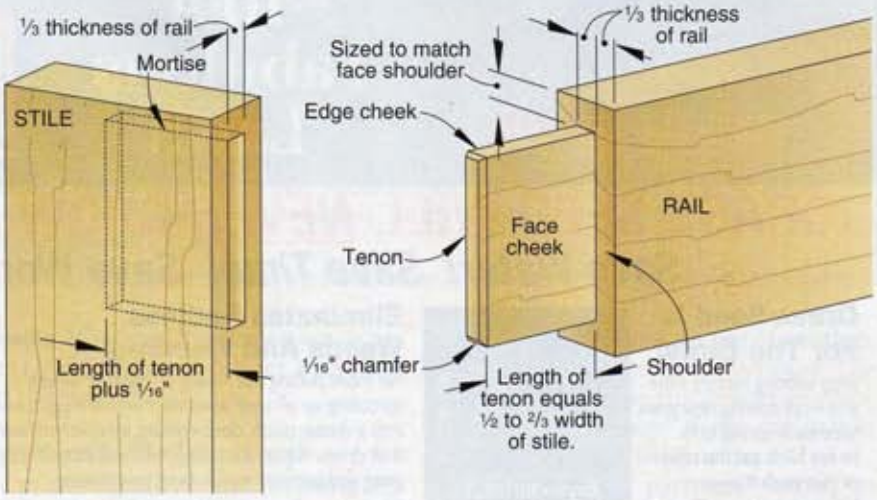
Mortise methods and tenon tenets

Q: Is there a rule of thumb for sizing a mortise-and-tenon joint?

—Michael Halloran, Richmond, Ky.



A: Of course, the specific mortise-and-tenon size will vary by application, Michael. But as a general guideline, make the tenon about ⅓ the total thickness of the tenoned workpiece, and about ½–⅔ as long as the width of the mortised workpiece. Though it's not structurally necessary, cutting a shoulder adjacent to the rail's edge as well as the face allows you to completely hide the mortise. To save setup time, size the edge shoulder the same as the face shoulder.

So, for example, for a matching ¾×2" stile and rail, first make the stile's mortise 1½" long, ¼" wide, and 1"–1⅜" deep; then make a tenon sized for a snug fit without forcing, leaving it about 1/16" short of the mortise depth to allow for glue.

Circle No. 1515

A pattern for preservation

Q: I was planning on storing the MDF templates for an Adirondack chair in my garage attic, but realized the humidity may warp them. How do you preserve your templates? These have photocopied patterns glued to one side.

—James Kahl, Edgewood, Md.

A: Because MDF has no grain, it is largely unaffected by changes in humidity, Jim. Unless you fear that water will drip directly on the templates, simply store them flat or drill a hole and hang them from a rafter. This prevents them from distorting under their own weight.

Sealing the patterns with a clear finish provides some protection from wear and tear, but the photocopied patterns may smear photocopier toner when you brush a finish on.

Instead, spray on a clear finish and don't touch the pattern lines or text until the finish is dry.

Photocopier toner doesn't stand up well to finishes. Test finishes on photocopied paper before using a brush to apply them.

continued on page 78

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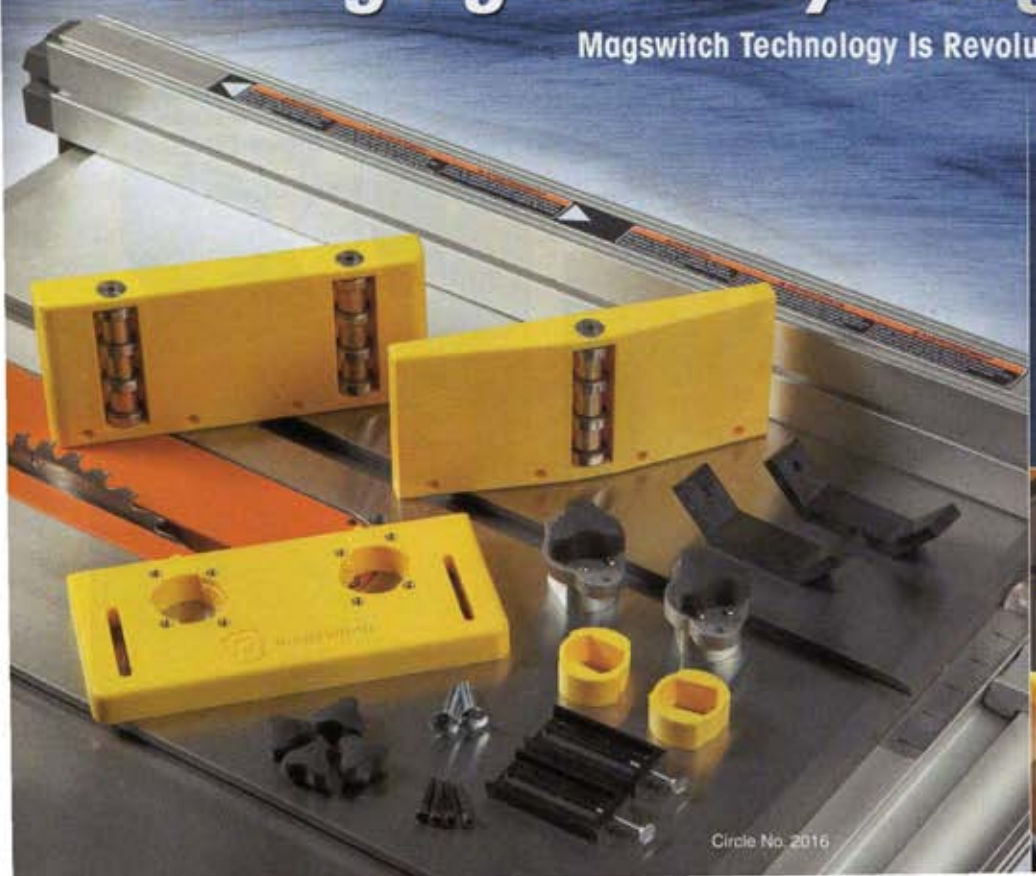

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Circle No. 802

Ask WOOD

What the heck is QSWO?

Q: I see the abbreviation QSWO in the woodmagazine.com forums a lot and have no idea what it means. Any help?

—Kent McDonald, Prince George, B.C.

A: QSWO stands for quartersawn white oak, Kent. In our fast-food, text-message world, words and phrases are becoming more and more abbreviated—even for woodworking terms. Let's decode some more of the abbreviations you might see tossed around woodmagazine.com/forums:

MDF = medium-density fiberboard
TS = tablesaw
BS = bandsaw
ROS = random-orbit sander
RAS = radial-arm saw
SCMS = sliding compound mitersaw

Even the less technical phrases of conversation get condensed online, such as:

PIP = project in progress
OT = off topic
IMHO = in my humble opinion
IIRC = if I recall correctly
AFAIK = as far as I know
OTOH = on the other hand
BTW = by the way
FWIW = for what it's worth
BORG = big orange retail giant (The Home Depot)
LOL = laughing out loud
ROTFL = rolling on the floor laughing
ROTFLOL = rolling on the floor laughing out loud
LOML = love of my life
...which is interchangeable with...
SWMBO = she who must be obeyed

SWIM (see what I mean), Kent? We sincerely HTH (hope this helps) clear things up. Thx for the ?, and C U L8R.

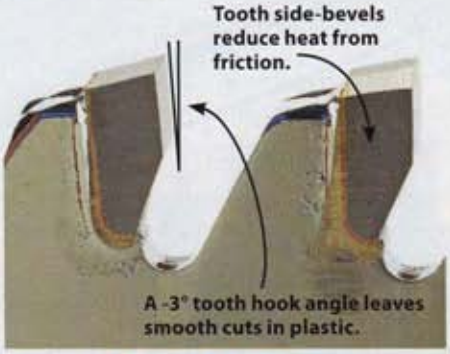
There's a clear choice for cutting plastics

Q: I make a lot of bird feeders with clear acrylic walls. I cut pieces 12" or narrower on my bandsaw, and for wider ones, I use my tablesaw with an 80-tooth veneer blade mounted backwards. This is hard on the blades and doesn't work very well. Is there a better way?

—Dick Webber, East Jordan, Mich.

A: For cutting large amounts of acrylic, go with a plastic-cutting specialty blade, Dick. These include 80-tooth, 10" blades, such as the Freud no. LU94M010 shown *below* ($65.85; 800-472-7307 or freudtools.com), the Forrest No-Melt ($216; 800-733-7111 or forrestblades.com), and the Infinity Cutting Tools Multi Material ($79.90; 877-872-2487 or infinitytools.com).

The teeth on plastic-cutting blades have a negative hook angle and beveled sides that cut cooler and smoother, especially on the bottom surface. Compare the negative-angle teeth on a plastic-cutting blade to the teeth of tablesaw blades made for woodworking, which usually have a positive hook angle for an aggressive cut. However, that angle leaves a rough edge on plastic, and the sides of the teeth can rub against the plastic enough to melt it. For best results with a plastic-cutting blade, set the height so that just half of the uppermost carbide tooth is above the acrylic, as shown *bottom*.



continued on page 80

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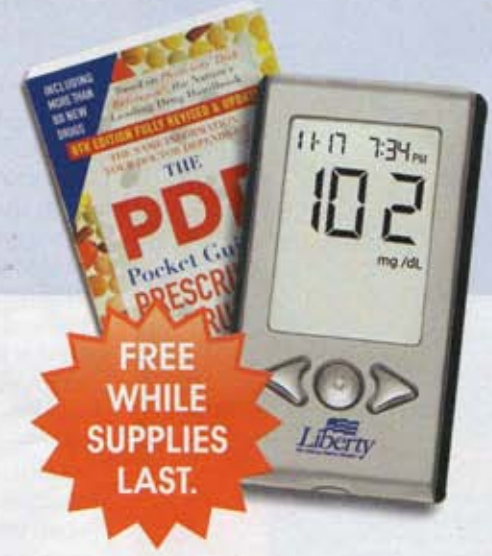

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Ask WOOD

Is all MDF created equal?

Q: I just got some medium-density fiberboard (MDF) from my local home center. It seems coarser than I'm used to and shreds when I cut or rout it. I thought all MDF was the same. What gives?

—Angela Kinast, Delaware, Ohio

A: Just like plywood, MDF comes in a variety of grades and compositions, Angela. Most MDF consists of refined Southern yellow-pine wood fibers mixed with resin. MDF made from wood fibers that have been refined to a consistent, small size gives you smooth, shred-free cuts and crisp profiles.

Unfortunately, some retailers get their low-cost sheet goods from overseas manufacturers that may not adhere to high quality standards. As the old saying goes, you get what you pay for.

Ask your local lumberyard or hardwood dealer for its MDF source. Most likely it is one of the many North American MDF manufacturers that have retained high quality control.

Both of these MDF sheets were chamfered with the same router and bit. The low-cost sheet at top yielded visibly coarser cuts with shredded edges.

Woodworking word of the day: chatoyance

Q: What is chatoyance? I read the word in a finishing article online, but my dictionary isn't much help.

—Robert Priboth, Madison, Wis.

A: Borrowed from gemology, chatoyance describes the color-changing properties of some woods, Robert. When the wood cells in a tree grow in nonuniform directions, light often reflects off the cells at slightly different angles. So a piece of wood can appear to be one color when viewed from one direction, but will change colors when rotated. The color changes may present as an undulating motion as you turn the wood, especially in figured wood, such as the curly maple tabletop shown *here*.

Dyes enhance chatoyance, penetrating deeply into the cell structure and lending an otherwise flat piece a 3D effect.

Pining for an even finish

Q: I use white pine in many projects because it's readily available and inexpensive. But I have problems staining boards a consistent color from one end to the other. What's the best way to stain pine?

—Jim Gray, Madisonville, Texas

A: If pine's soft earlywood were as hard as its dense latewood, your staining problems would be over, Jim. However, that soft earlywood acts like a stain sponge, leaving behind a blotchy surface. To beat the blotch, try this two-pronged approach regardless of how dark you want the wood. First, sand the entire project to 180 grit. Thoroughly wet one surface at a time with a damp cloth so the moisture reaches just beneath the surface. Then immediately wipe the surface dry and apply a dye that's the shade you want. We aimed for a dark finish on the test board *below*, so we used antique mahogany dye (#40, W.D. Lockwood, 866-293-8913 or wdlockwood.com).

Allow the dye to dry overnight; then lightly sand the wood with 220 grit to remove nibs. Wipe the surface clean and seal the wood with a ½-lb cut shellac or with varnish that's thinned 75 percent with mineral spirits. Hand-sand the sealed surface evenly with 220 grit, and apply a pigmented stain over the sealer. Choose a stain that's close in color and darkness to the dye. If you want a still darker surface, repeat the sealer/stain combination. Cover the final coat of stain with a clear finish.

continued on page 82

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Ask WOOD

Planer versus pressure-treated

Q: My deck, made of pressure-treated pine, is beginning to look weathered. Is it safe to remove the boards and "freshen them up" by running them through the planer?

—Brent Moore, Jefferson City, Mo.

A: Aside from the blade-dulling grime unavoidable in deck wood, there are a couple reasons to avoid power-planing pressure-treated (PT) lumber, Brent. PT lumber produced prior to 2003 was treated with Chromated Copper Arsenate (CCA), a preservative containing arsenic. Safety gear, such as gloves, respirators, and proper dust collection, protects you during normal handling. However, the debris created when planing increases your exposure and the chances of introducing the arsenic into the environment.

More recent PT lumber is infused with Alkaline Copper Quaternary (ACQ), which contains no harmful arsenic. However, ACQ has a higher copper content that speeds rust in any ferrous metal it touches—not the type of shavings you want inside your expensive machinery.

For a quicker, easier solution, try removing the deck boards and simply flipping them over. The less-exposed bottom face will not have weathered as much, and a light power-washing will have them looking brand new.

Use "The Yankee Flip" as a thrifty way to revive the look of weathered deck boards.

Give desert-bound bubinga time to dry

Q: To make my future dining-room table, I recently purchased a bubinga board 2" thick, 3' across, and 15' long. I had it shipped from Oregon to Tucson, Arizona, where I cut it into three equal lengths and sealed the ends. How long should it acclimate before I use the boards? I was told it was kiln-dried, but don't have a moisture meter to check for sure.

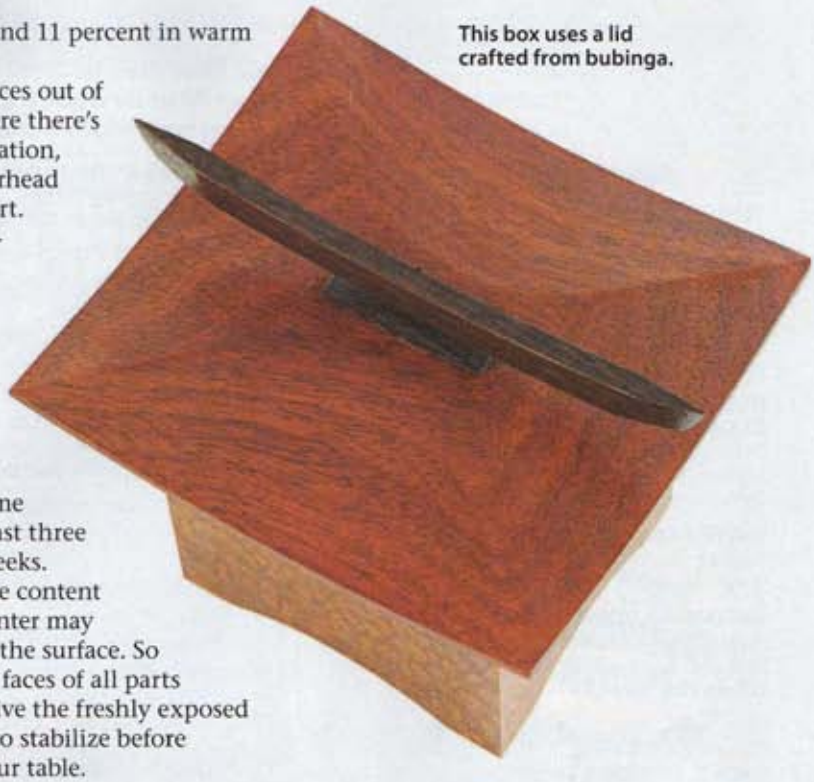
—Matt Sandoval, Tucson, Ariz.

A: Given your dry locale, Matt, even an inexpensive moisture meter would be a good investment. (Grizzly offers the Mini-Ligno no. G1491 for $100. Call 800-523-4777, or visit grizzly.com.)

Whether or not the boards were kiln-dried, they face a considerable climate change moving from Oregon to your Arizona home. Wood for indoor projects in the Southwest should average 6 percent moisture, compared with 8 percent throughout most of the United States and 11 percent in warm coastal areas.

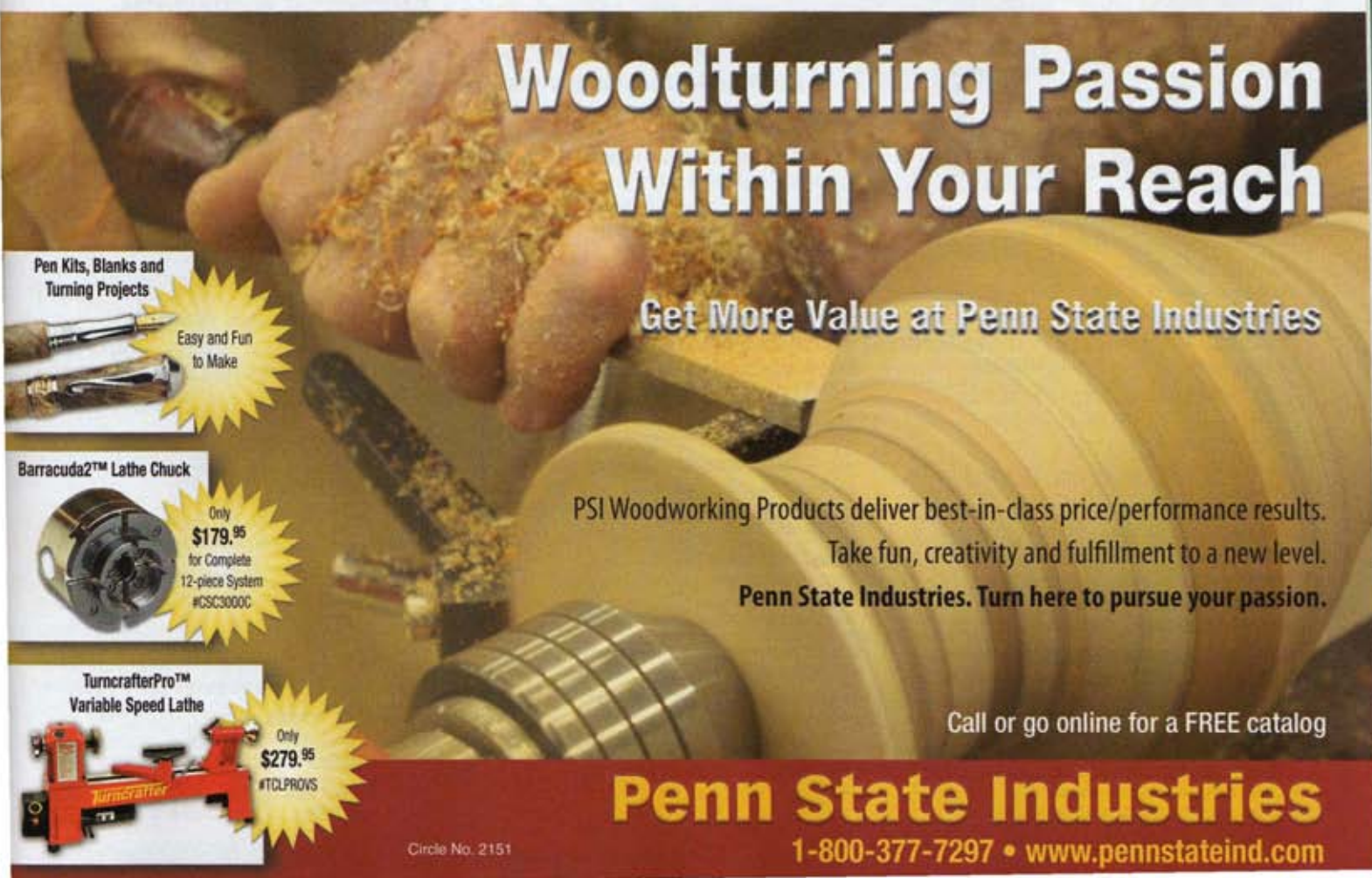
Store the pieces out of direct sun where there's good air circulation, such as an overhead area of a carport. Shim the stickered pieces so the bubinga rests completely flat. Then check the moisture content each week until the readings become stable for at least three consecutive weeks.

The moisture content close to the center may exceed that at the surface. So machine both faces of all parts equally, and give the freshly exposed surfaces time to stabilize before assembling your table.



This box uses a lid crafted from bubinga.

continued on page 86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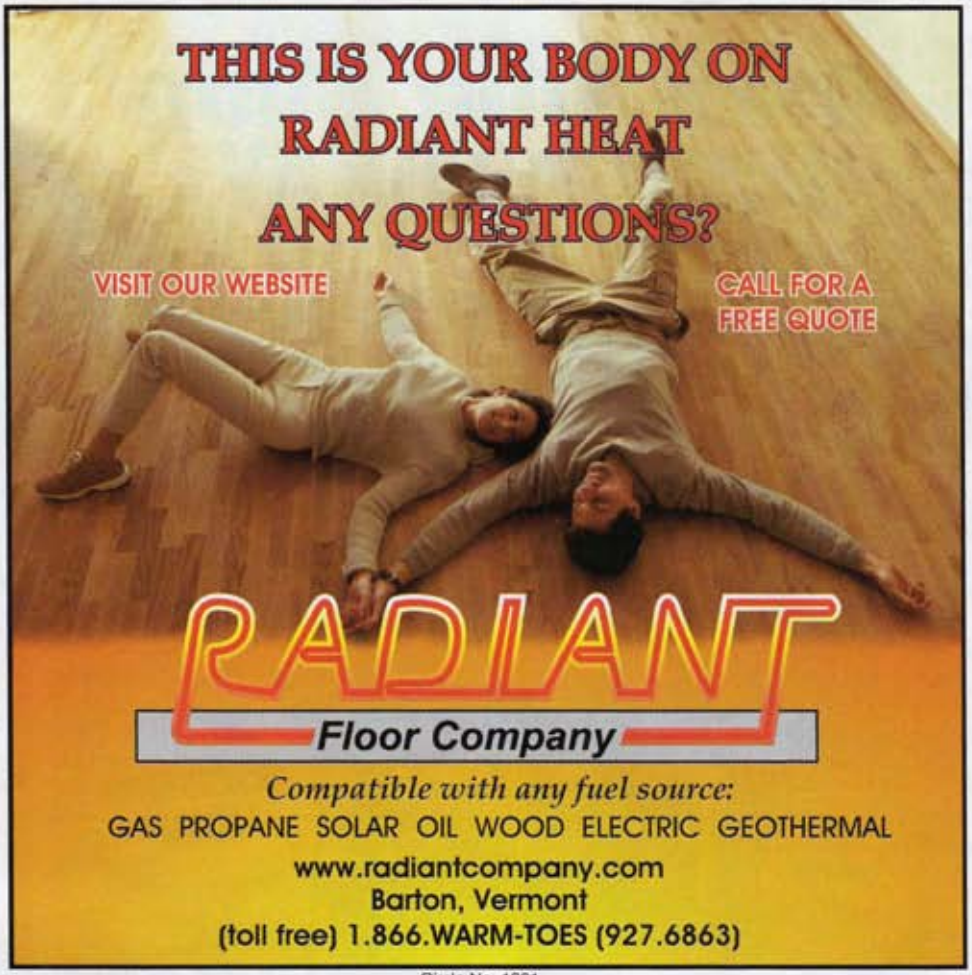

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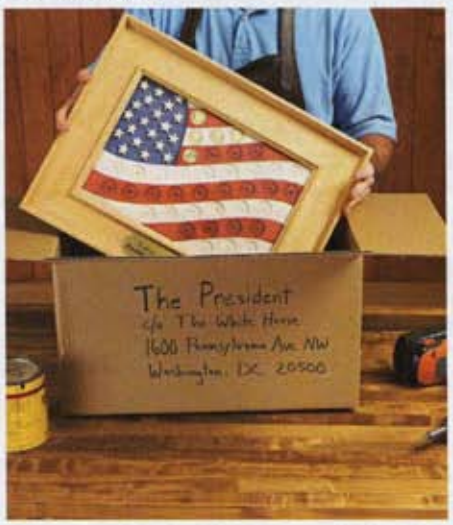

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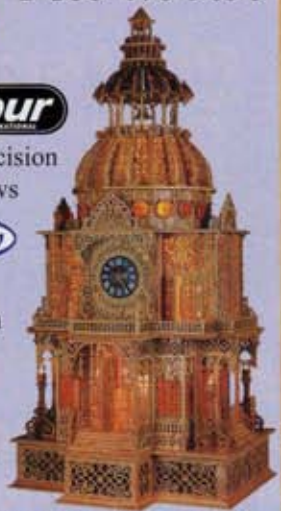

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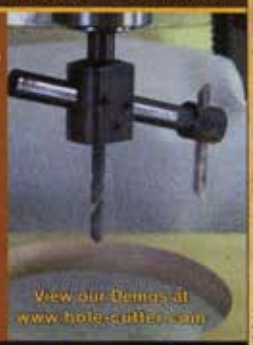

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A look inside the May 2009 issue (on sale March 17, 2009)

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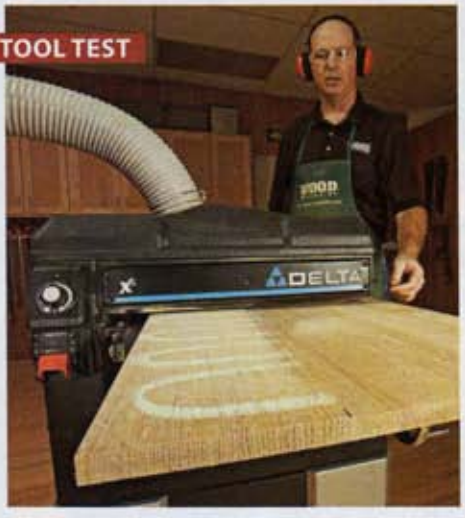

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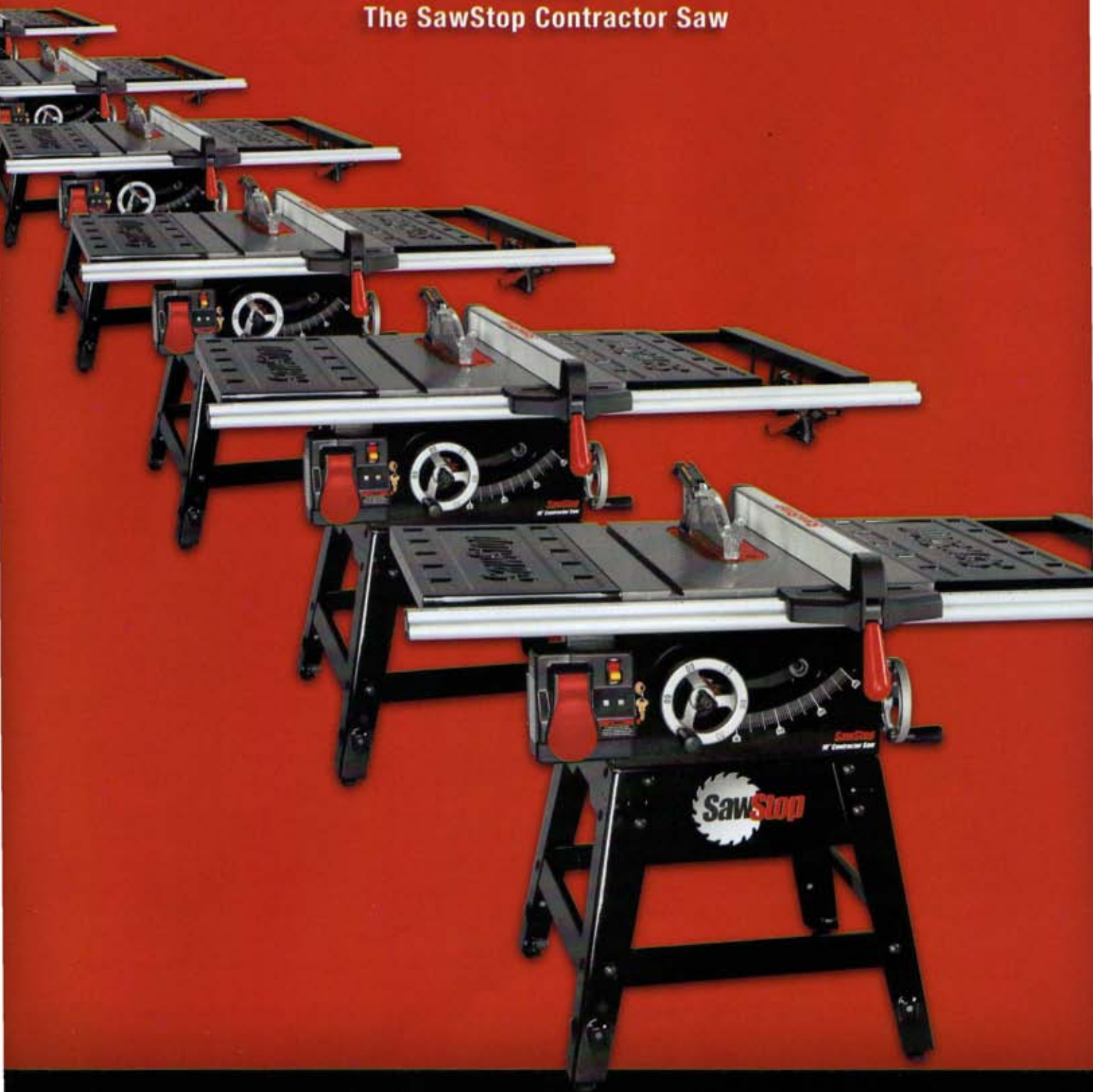

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